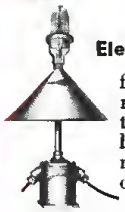
AVIATION WEEK
A McGRAW-HILL PUBLICATION
AUG. 30, 1948

AIRPORT LIGHTING ENGINEERED BY L-M

L-M Airport Lighting is designed by airport lighting engineers, who also engineer the installations. L-M offers complete equipment for the largest airports; and specialized "package" lighting for smaller airports at a cost for equipment of only $1 per runway-foot. All meet CAA specifications.

L-M–Bartaw High Intensity Runway Lights
up to 180,000 beam candlepower



Medium Intensity Elevated Runway Lights
for secondary runways and taxiways at large ports; main runways of smaller fields.

Rotating Beacons
Two sizes—1000 watt, 325 watt sealed beam type; for largest and smallest fields.

Obstruction and Marker Lights

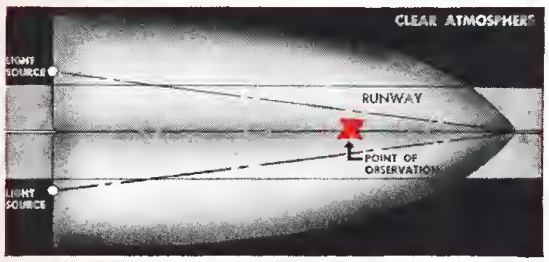
Control Panel and Power Units

include all switches, selectors, intensity and beam control, breakers, fuses, etc. for entire system. Also transformers, cable, fuse cutouts and other required equipment.

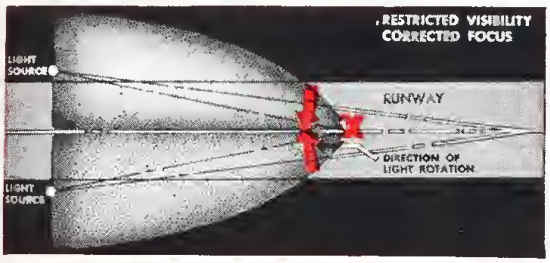
APPROACH LIGHTING

L-M—Bartow approach lighting is now being rigorously and extensively tested under ANC supervision. Like all L-M—Bartow equipment, it will not be announced or offered until fully approved. For the basic principles, see pages 18 and 19 of brochure described at right.

only the fully controllable beam of *L-M–Bartow* *approach and runway lighting* permits the very high intensity of 180,000 cp



In clear weather, intensity can be reduced; lights are aimed to meet at a distant point. (Angles are exaggerated to simplify the diagrams.) All lights appear of approximately equal intensity *to the pilot.*



With lowered visibility, intensity of the lights must be increased; beam direction is corrected (red arrows), securing maximum possible penetration. And there is *no glare*, even at maximum beam candlepower!

Brings them in all over the world

L-M—Bartow pioneered high intensity lighting and is today's leader, both in quality and in number of installations in operation or being installed—at Boston, Chicago, LaGuardia, N. Y. International, Newark, Minneapolis-St. Paul, Raleigh-Durham, St. Louis, Salt Lake City, Worcester, and others. Many foreign installations, including Dublin, Shannon, Brussels, Hankow, Canton, Lunghwha, Caracas, Panama, and dozens of army and navy fields.

How it Works

Both intensity and beam direction are automatically controlled from the tower. When visibility decreases, the light intensity is raised and the lights are "coned in" to the correct angle of maximum penetration. As the pilot picks up the beam of the first lights, he sees them at maximum, *glareless* intensity; as he comes nearer, he is at a different angle to the beam pattern and the optical system reduces the intensity so that the lights appear no brighter than when he first saw them. The L-M—BARTOW system—and *only* the L-M—BARTOW system—makes it possible to use the extremely high beam intensity of 180,000 cp. *without glare*, to reach out farther and "bring 'em in alive" when every foot of distance counts.

Write for this brochure

"The Lights that Bring Them In" explains the principles of runway lighting in illustrations, charts—it's worth reading. If you haven't a copy, ***write Line Material Co., Airport Lighting Division, East Stroudsburg, Penn.***

LINE MATERIAL Airport Ligh

Vol 49, No. 9 **AVIATION WEEK** August 30, 1948

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The Lesson of the Airlift

The Berlin airlift is enough to throw chills into the hearts of logistics men.

At first, according to reports, military men on the spot said the airlift couldn't supply enough coal to keep Berlin going Then it did Next, logistics planners and transportation specialists said the airlift couldn't keep up during the winter months Now it is generally agreed it can go on.

So, the Berlin airlift is a success and can for an indefinite period keep 2,500,000 people supplied. That's what is causing careful reassessment of air cargo's capabilities all around the world.

In some quarters there is heard the argument that the airlift means little, it is over a distance of only about 250 miles. Airlift over ranges of several thousand miles would be so costly as to be prohibitive.

That reasoning ignores the major lesson of Berlin If there is no other way to supply a given area, it can be done by air.

But Not Enough Planes

The thing about the Berlin airlift that has brought the planners and transportation experts up short is a numbing fact The U. S. doesn't have enough cargo planes on hand to pull another Berlin (without going on a war footing and requisitioning commercial planes). And the U. S military forces certainly do not have enough cargo planes to make possible air supply of foreign bases in case of war.

To keep the short-haul Berlin effort alive, Military Air Transport Service has had to cut its other services about 30 percent. It has had to take one of its 14 mammoth C-74 transports off the Caribbean routes.

Here's how grim the military air cargo situation appears to one longtime air cargo student: On 'M' Day 4000 C-54-type cargo planes would be needed From all sources, the services today could scrape up 651 planes —about 16 percent of requirements.

Wanted: Experience

Making those figures even more disconcerting is the fact that the job for the 4000 C-54s could be done by only 800 new-type cargo planes, each of 20 ton payload. The rub is that the 800 new-type cargo planes aren't in existence And there is no sign they will be for years to come.

No one, airlines or government, has ordered them.

Those close to air cargo see the military and commercial fields as one. That's where the argument breaks down that the building and storing of a pool of cargo planes against an emergency is a job for the military.

There's this difference between storing cargo planes and cargo ships: U. S. Merchant Marine can't be operated at a profit anyway, it's cheaper to "pickle" the ships rather than scrap them and rebuild, and they don't become obsolete very fast (backbone of the World War II merchant fleet, the Liberty ship, was an 1898 design).

Commercial cargo planes—modern ones, specifically designed for cargo—can be operated at a profit. The field for them—long distance, high payload—is practically untapped because present planes, chiefly conversions from basic passenger types, have neither the necessary range nor capacity.

Ships vs. Planes

Since the mid-thirties, the U S Merchant Marine has been kept alive by subsidies for one reason alone. so it would be on hand in case of war The realization is coming slowly that that's a good reason also to keep a large air merchant marine on hand.

Discount much of the material now being spread around that cargo planes can't do the work of ships and won't be able to in the "foreseeable future."

Most of it stems from a wartime study that used as a base for calculations a bomber conversion that had long range but little payload. Some more comes from studies using present converted passenger planes as the guide. None of the survey has been based on a fleet of planes such as the Douglas Airfreighter, the Curtiss CW-32 or Boeing Stratocruiser.

Here's What They See

Here's the way logistics planners look at the ships vs. planes argument in supplying overseas bases:

- Undersea warfare capabilities of the only potential enemy, Russia, are about 300 times as great as those of Germany at the peak of World War II U-boat warfare Call that a factor of 300.
- Greatest factor in favor of ship transit of supplies as against airlift is fuel cost That factor is 65.
- In war the measurement is time, not dollars.

The real stumbling block to air supply is not cost of fuel, but amount of fuel There is doubt that the country has the capacity—or could quickly get it—to produce enough high-octane fuel to keep a major long-distance airlift going.

But that appraisal is based on consumption of presently used engines, not the much more economical compound engines now being tested These engines, plus such techniques as "cruise control" used on B-29s might ease the fuel worry.

Meanwhile, both military and commercial cargo people are trying to capitalize on the one thing that can't be talked down: The Berlin airlift is a success.

NEWS DIGEST

DOMESTIC

Northwest Airlines will retire DC-3s on all routes Sept. 1 in favor of Martin 2-0-2s. Two DC-3s will be kept—one for Chicago-Minneapolis cargo operations and one for pilot checking. Others have been sold, some to China.

Robert C. Loomis, former TWA director of maintenance, has been appointed flight test and research director for Consolidated Vultee. He joins a growing group of former TWA officials brought to Convair by LaMotte T. Cohu, Convair prexy and former TWA head.

Richard W. Millar will retire as chairman of the board of Northrop Aviation, Inc. to devote all of his time to activities outside the aviation industry. He will remain as a director and chairman of the finance committee.

Ryan Aeronautical Corp. was awarded an Air Force-Navy development contract for an XQ-2 jet-propelled target missile. It is about half the size of a standard fighter and has a speed of 600 mph. A service test quantity of the missiles will be built for joint use of both services.

FINANCIAL

Solar Aircraft Co. reports a net profit of $202,900, or 41 cents per share, for the quarter ended July 31. Figure compares with $187,517, or 37 cents a share, for the same period last year. Company backlog July 31 was $11,346,000, compared with $9,125,000 on Apr. 30.

Piasecki Helicopter Corp. reports 1947 operating income, after taxes, of $4,178. Company has revised its accounting system, and explains in its annual report that under its previous accounting method net operating income for the year would have been $125,141, compared with $16,413 in 1946.

FOREIGN

Hawker-Siddeley has purchased an aircraft factory building at Malton, Canada from the Canadian government. The facility will be used for the overhaul and maintenance of aircraft and engines produced by the British firm.

Philippine Air Lines has suspended operations between Manila and Shanghai, China, due to the chronic currency exchange difficulties in the latter city. Twice weekly flights between Manila and Hong Kong will continue, however, to provide a China connection with PAL's trans-Pacific service using Douglas DC-6 transports.

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CAB Backs 10 Percent Airline Fare Hike

Raise to 6.5 cents a mile contemplated; American objects to any above 6 cents.

By Charles Adams

Asserting that higher passenger tariffs are not only justified but required, the Civil Aeronautics Board threw its influence behind a 10 percent industry-wide fare increase at its recent closed meeting with top trunkline officials in Washington.

As a result, rates will almost certainly go up on a broad scale next month despite widespread feeling among executives of many smaller carriers that customer resistance may actually cause revenues to decrease. CAB's strong endorsement of higher fares came as no surprise in view of its blunt warning nearly two months ago that mail pay would not be used to compensate the airlines for all the increased costs arising from the inflation spiral (AVIATION WEEK, July 19).

Shortly after the conference, CAB Chairman Joseph J. O'Connell, Jr., indicated that substantial agreement had been reached on the scope of the tariff hike. He said the "big five" trunklines would probably raise their basic and premium fares 10 percent and the smaller carriers would meet the new charges on links where they compete with American, Eastern, Northwest, United or TWA.

▶**Smith Replies**—Repercussions from O'Connell's statement were immediate. C. R. Smith, American Airlines board chairman, made it clear that his company has no intention of seeking any rate higher than 6 cents a mile—the current charge of its premium fare DC-6s.

Early this month (AVIATION WEEK, Aug. 9) American decided to increase DC-3, DC-4 and Convair Liner tariffs to 6 cents effective Sept. 1, but proposed eliminating the DC-6 premium at the same time. Since about 65 percent of AA's passenger mileage is in DC-6s, most of the carrier's traffic would be unaffected by the proposed fare hike.

"It is our firm belief that any general fare increase beyond the 6 cents a mile level will place our rate structure in the area of diminishing returns," Smith declared. "American recognizes the need for additional revenue, but in our opinion you do not secure it by encouraging passenger price resistance and pricing yourself out of the market. We told CAB that we would take in less money at 6¼ cents than at 6 cents."

TWA and United Air Lines also have filed for a 10 percent passenger fare increase (combined with a 5 percent roundtrip discount) effective Sept. 1. But besides raising their basic tariff from 5½ cents to 6 cents a mile, they would keep the half cent premium on their DC-6s and Constellations.

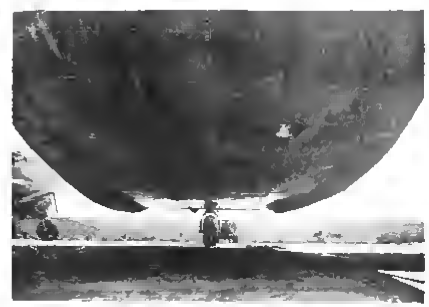
▶**Charge for Meals**—Shortly after American's fare policy pronouncement, United issued a blast against proposals to make a separate charge for meals in flight. CAB Chairman O'Connell said that a majority of the Board would have endorsed an additional fee for meals if they had been asked to do so at the Washington meeting. He explained, however, that CAB will give the subject more thought and advise the industry later of its conclusions.

FIRST MULTI-ENGINE TURBOPROP AIRCRAFT

Shown on the ground, the Vickers-Armstrong Viscount is the first multi-engined aircraft in the world to fly with propeller turbines. Craft has a pressurized fuselage maintaining ground level conditions up to 15,000 ft. This plane is provided with 32 seats, but another version will have 36 seats. The craft was produced on order of the British Ministry of Supply and was intended as a short range transport for British European Airways. However, BEA since has decided on the Airspeed Ambassador. The Viscount is equipped with four Rolls Royce Dart turboprops. It is claimed that the craft handles very smoothly and is "quiet except for the high pitched whine of the engine's compressor." The future of the plane still is in doubt.

They Planned It . . .

To find out just what would happen when its feederline transport landed gear up, Beech Aircraft Corp. set its Twin-Quad down on muddy ground beside Beech Airport. The craft landed on keels built in each side of the belly and stopped after 615 ft. Landing caused no skin buckling on either sides or bottom. Propellers were not damaged, as the high wings afford ample



. . . This Way

clearance between the props and ground. Bottom of the keels is shod with stainless steel which projects three inches below the bottom of the airplane. Although the soil was muddy and soft, keel tracks show that the bottom of the plane itself did not touch the ground at any time. Tracks also show how landing "run"—except for initial swerve—was fully controlled.

Early last week UAL President W. A. Patterson stated that whatever other airlines may do his company does not intend to make a separate charge for meals on its planes. "I can't understand how anybody could be so naive as to believe meals are not included in the price of the passenger's ticket," Patterson declared.

"Meals have always been included in the price of our tickets. They have become part and parcel of our standard of service and have proved immensely popular with passengers. Furthermore, they cost us only two tenths of a cent per passenger mile, which is negligible compared with other costs also included in the ticket."

▶**Study Prepared**—During its conference with industry officials, CAB presented a study showing that the 16 domestic trunklines' operating loss of $20,900,000 last year might have been cut to $9,900,000 had meal service been eliminated. The survey indicated that food costs aggregated $9,000,000 in 1947, while salaries and expenses of second stewardesses earned on large equipment because of meal service totaled $2,000,000 more.

Eastern Air Lines President E. V. Rickenbacker agreed with the CAB majority that passengers should be charged extra for meals in flight. But other officials either supported Patterson or indicated that while separate meal charges might be desirable they might prove impractical.

While CAB vigorously backed a general trunkline fare increase, it emphasized it also favors in principle cut-rate promotion tariffs which generate additional business during slack periods. American Airlines has already taken steps to offset higher basic fares by asking the Board's approval for special family rates during the first three days of each week, when business is usually slack.

▶**Second-Class Fares**—Discussion of second-class fares similar to those offered by transcontinental nonscheduled lines were excluded from the agenda before the conference started. But the issue cropped up again soon after the meeting broke up.

The Air Coach Association, representing three irregular coast-to-coast operators, issued a statement condemning as "shortsighted" the decision to raise certificated trunkline passenger fares. Stanley Weiss, head of the group and president of Standard Air Lines, said the certificated transcontinental carriers are in a "financial mess" today because their fares are already so high that only wealthy travelers or persons on expense accounts can afford to fly.

Production Figures Up, Airframe Value Falls

Aircraft production for June, booked by output for the military, exceeded the previous month by 48 percent to reach 4,195,000 lb. of airframe weight, highest since the postwar peak in May, 1946.

The 1186 aircraft shipments reported jointly by the Bureau of the Census and Civil Aeronautics Administration compared with 953 in May. Of the total 227 were military, against 141 in May, and 959 were civil, against 812. Of the latter, personal planes accounted for the gains, with 926 in June against 778 in May. Transport plane shipments stood about the same—33 in June compared to 34 in May.

▶**Backlog Omitted**—With military payments omitted, a slight drop was shown in value of shipments. Planes and other products of civil aircraft plants amounted to $21,813,029 in June, where they had been $23,310,207 in May.

The Bureau promised a showing "in the near future," however, of backlog for aircraft, engines and propellers.

▶**Personal Planes**—In the personal plane category, later figures for July showed a drop. Personal Aircraft Council of the Aircraft Industries Association reports that eleven companies shipped 868 personal aircraft—424 four-place and 444 two-and three-place planes—against 912 for twelve companies in June.

July personal plane shipments reported value was $3,538,000. With July value were valued at $3,234,000, June figures in totals for the first seven months of the year were 4725 commercial sales value $18,154,000.

▶**Military Shipments**—The joint report by Census and CAA showed total military shipments for the first six months of 1106 aircraft, against 680 in the same period of 1947. This increase was insufficient however to offset a drop in civilian aircraft production in the same comparative six-month period, and the total number of aircraft shipments stood at 5144 for the first half of this year—less than half the 11,423 for the initial six months of 1947.

Here is how civil aircraft production was divided:

	January-June	
	1948	1947
Personal	3914	10,600
Transport	124	143

Parallel with production increases were those in employment. These went up from 136,542 aircraft and 34,043 engine plant employes in May to 140,382 and 34,741, respectively, in June.

Irregulars Accused of Conspiracy

AA files complaint with CAB charging that coast-to-coast carriers are plotting to evade nonsked exemption.

American Airlines has called on the Civil Aeronautics Board to tear away a web of conspiracy which it alleges irregular transcontinental carriers have woven to evade and defeat the requirements and purposes of the nonscheduled exemption.

The move came in the form of a complaint against Air America, Inc., San Pedro, Calif., which began "irregular" coast-to-coast service early this summer and already has become one of the most important operators on the run.

American's action coincided with a CAB order requiring another transcontinental nonsked—Nats Air Transportation Service, Oakland, Calif.—to show cause why its letter of registration should not be revoked for knowing and wilful violation of the Civil Aeronautics Act.

▶**Agreement Cited**—Most spectacular of American's charges against Air America was that the new carrier has an agreement with Standard Air Lines and/or Viking Air Lines whereby the planes of one nonsked would be transferred to another if the first operator's letter of registration should be suspended or revoked by CAB. Standard and Viking—two of the largest transcontinental irregular lines—already have been named in CAB show cause orders similar to that issued against Nats Air Transportation Service.

American said another part of the alleged understanding provides that if the letter of registration of Air America, Standard or Viking is revoked or suspended, one or more of the three would purchase or merge with some other nonsked holding a valid operating permit. At present, American declared, the three irregular carriers work closely with ticket agencies so that through alternation of flights or other arrangements an illegal regular service can be furnished between designated points.

▶**Action Requested**—The complaint concluded with a request that CAB investigate the operations and activities of Air America and issue an order for the nonsked to show cause why its letter of registration should not be revoked.

American Airlines said Air America's president is Fred A. Miller, one-time vice president of the Flying Tiger Line which leased aircraft to Edward Ware Tabor's Trans Atlantic Airways before TAA's letter of registration was suspended last May. "On information and belief, Air America has leased two or three DC-4s from the Flying Tigers (a scheduled all cargo carrier), and pilot are customarily furnished by the Flying Tigers to Air America for passenger operations."

The complaint added that on one or more occasions during the past two months Air America and the Flying Tiger line have been jointly responsible for passenger operations between California and New York. "It is believed that the passengers were obtained by Air America, but the flights were operated by the Flying Tigers."

▶**Other Charges**—American Airlines also charged that Air America has:

- A very close traffic pooling agreement with Standard which has not been submitted to CAB for approval. When Air America has failed to obtain a satisfactory load for a flight, Standard reportedly has handled the passengers to whom tickets were sold. Similar arrangements with Standard have been made when Air America had too many passengers for a trip or when there was an equipment failure.
- On a number of occasions sold tickets for DC-4 transcontinental flights but actually made the runs in DC-3s without advance notification to persons holding reservations.
- Permitted ticket agencies to understand that Air America was "the same company" as Standard and Viking.
- Obtained traffic by representing it would make a particular flight and then has declined to transport the passengers on its own aircraft.

F-84 Disintegrates

Carl Bellinger, Republic Aviation Corp. test pilot, jumped from a disabled F-84 jet fighter at 12,000 ft., when the craft went out of control. The pilot landed in the Atlantic Ocean and was rescued by two small boys. Bellinger was on a routine instrument check flight of a new F-84 model when the plane went out of control. It disintegrated after the pilot jumped.

Strike Averted

A strike of 1000 workers at the A. V. Roe turbojet engine plant at Malton, Ont., has been averted by acceptance of a company offer of 10 cents an hour. The union originally demanded 15 cents.

Three New Aviation Lobbyists Register

Three new representatives for aviation interests have registered with the clerk of the House and the secretary of the Senate under the lobby control provisions of the 1946 Congressional Reorganization Act.

• **Jess B. Heonell** Braniff Airways, who listed a salary of $9000 a year and said he is "permanently employed" by the airline "for contacts in Washington, D. C., and the capitols of South America."

• **Harry Meixell,** National Aviation Trades Association, who reported a retainer of $11,000 a year for services as executive director of the association and

• **Spence Hotchkiss Parker & Duryee** New York law firm, which reported an annual retainer of $5000 for representing the Aircraft Industries Association.

Already registered aviation representatives who filed reports of activities for the second quarter were:

• **Frazer Bailey,** president of National Federation of American Shipping, formerly president of Matson Navigation Co. and a spearhead in the sea-air movement. Bailey reported payment of $2500 for the quarter for activities in connection with maritime legislation.

• **Jess Bennett** reported an income of $2250 from Braniff International Airways for the quarter, plus $702 for expenses and entertainment.

• **Larry Gates,** Air Line Pilots Association, reported receipt of $2328 from the Association for the quarter and expenditure of $538 mainly in connection with the National Airlines pilot strike.

• **John C. Cone** Pan American Airways, Inc., reported illness during the second quarter which precluded any activities. Cone registered at the beginning of the year, listing his income as an officer of the airline as $15,000 a year. He is the only Pan Am representative to register since the 1942 act became effective.

• **Donald Cook,** Transportation Association of America, long time advocate of integration of transportation ownership, listed a salary of $2250 for the quarter and expenses of $452 in connection with his activities.

• **Oliver P. Echols,** president, Aircraft Industries Association, reported no income for the quarter aside from his salary ($25,020 a year) for activities in connection with the establishment of a national air policy.

• **Tiery Ford,** chairman of the Sea Air Legislative Committee, reported no activities during the second quarter to promote the sea-air issue.

• **Ben Geaslin,** Waterman Steamship, also reported no activities on the sea-air issue for the quarter.

• **Joseph Greenwood** Sea-Air Legislative Committee reported receipt of $500 in connection with promotion of the sea-air issue.

• **Berl C. Gross,** Hill & Knowlton public relations representative of Aircraft Industries Association, reported an expenditure of "Less than $100" for purposes that might be interpreted as indirectly influencing legislation on aviation and the oleomargarine tax.

• **Vernon A. Johnson,** Lockheed Aircraft, reported receipt of $3445 from the corporation for the quarter ($2700 salary, $698 for expenses, including $443 for entertainment).

• **Robert Kline,** attorney, reported no action in promoting the sea-air issue for the quarter.

• **W. Bruce MacNamee,** National Federation of American Shipping, reported a salary of $1250, allocable to legislative activities for the quarter, plus $267 for expenses.

• **Harold Mosier** Glenn Martin Co., reported a salary of $3902 for the quarter, plus reimbursement for expenses of $482.

• **L. Welch Pogue,** Committee for World Travel, reported a retainer of $4500 for the quarter from the organization.

• **George Van Nostrand,** American Airlines, listed a salary of $5630 for the quarter for all activities as assistant vice president of the airline and reported an expenditure of $110 in connection with activities involving air transportation legislation.

• **Robert Ramspeck,** Air Transport Association, reported expenses of $28 in connection with activities on air transport legislation during the quarter.

British Have Secrecy Problems, Too . . .

(McGraw-Hill World News)

LONDON—For a brief 24 hours recently Hawker Aircraft Company, Ltd., Kingston-on-Thames, drew the curtain and revealed that they have completed the prototype of a new jet fighter, the E 38/46, substantially the same as their N. 7/46 (which first flew a year ago, in September 1947) but with swept back wings.

This was the first disclosure that such a plane existed.

The builders apparently felt there was nothing to hide about the new fighter, developed for the Ministry of Supply, who had Naval Aviation in mind as potential user for the plane as a carrier-based fighter. They announced that they intended to exhibit the E 38/46 in the static display at the September exhibit of the Society of British Aircraft Constructors at Farnborough Sept 7-12.

► **Lid Back On**—Then the Ministry clamped down. To them, the E 38/46 was still on the secret list. Consequently, the new plane will not be shown at the SBAC exhibit, and no further details can be divulged. It has not yet flown. No production order has been placed, which is understandable.

This much is certain, however: the new Hawker plane, like the N. 7/46, is powered by a Rolls Royce "Nene" turbojet (5000 lb. thrust), and, like its hangar-mate, has twin air intakes in the leading edge of the wing roots (one on each side, close to the fuselage) and twin exhaust outlets from the trailing edge of the wing roots, rather than a single exhaust in the tail.

Speed of the E 38/46 should be well over 600 mph maximum, which is expected to be attained easily by the N. 7/46.

Both the N. 7/46 naval fighter version and an RAF version of the same basic plane, designated the P. 1040, will be exhibited at Farnborough by Hawker, who will be remembered as builders of the Battle of Britain's "Hurricane" and, later, the "Typhoon", "Tempest" and, currently, the "Fury" and "Sea Fury" fighters.

Aircraft Use Up, CAA Survey Shows

More hours of flying and higher plane utilization by private and nonscheduled commercial aircraft are reported for 1947 in a Civil Aeronautics Administration survey released this week.

Hours totaled 16,370,000, or 67 percent more than the 9,788,000 for 1946. Average hours in all types of flying was 190, compared with 183 in 1946.

The survey, forerunner of a detailed analysis of aircraft use last year, shows that of total hours flown 63 percent were instructional, 16 percent personal usage, 12 percent business flying and 9 percent transportation for hire and other revenue producing activity.

► **Utilization Spread**—Utilization ranged from a 317-hour average for training planes (261 in 1946) down to 60 hours for planes in personal pleasure flying. It also increased for aircraft used to carry for hire and other revenue producing operations, which averaged 90 and 102 hours respectively, compared with 87 and 73 in 1946.

MATS Service Cut

Diversion of Military Air Transport Service aircraft to "Operation Vittles" in Germany has forced an overall cut of about 30 percent in passenger and freight service in other areas of the service. Military mail has not been cut, however, and each flight carries all the mail ready for it upon departure. Operational reductions include:

► **Continental Division**—Douglas C-47 aircraft replace C-54 aircraft on transcontinental and feeder services and one weekly flight cancelled.

► **Caribbean**—Some schedules curtailed south from Jacksonville. Service to Rio de Janeiro and Balboa continue using Douglas C-74 transports.

► **Alaska**—Normal weekly schedules cut 20 percent but through routes to Tokyo via Aleutians remain unchanged.

► **Central Pacific**—Twelve flights between mainland and Honolulu suspended. Guam and Manila flights unchanged and Guam-Tokyo schedules slashed in half.

► **Atlantic**—No reduction in tonnage moved over this route by Navy components operating north and east.

Watching the head form catapult demonstration are (left to right) Dr. T. P. Wright, Cornell vice president for research; Dr. Emerson Day, Cornell Medical College; Dr. C. C. Furnas, Cornell Aeronautical Laboratory director; Hugh De Haven, Crash Injury Research director; Dr. Norman Moore, chief medical officer, Cornell; Dr. Richard Parmenter, coordinator of research, Cornell; Dean S. C. Hollister, Cornell College of Engineering; and Edward R. Dye, manager, lab development division.

Crash Survival Chances Measured

Research group devises method for studying ways to prevent head injuries—most frequent fatality cause.

The experts of the Crash Injury Research project administered by Cornell University have come up with a new means to measure the chances of surviving an airplane accident.

How they do it is shown in the photograph above. A plastic head form having the approximate weight and overall characteristics of a human head is catapulted 17 ft. down the track into various objects and structures normally located in aircraft within striking distance of the head. (Many of CIR's personal plane accident reports show that the seat belt holds and the body is jack knifed forward so the head hits anything in front of it.)

On the catapult, the head form reaches velocities up to 100 feet per second before it hits.

► **Danger Point**—While this is only one of Crash Injury's experiments, it ranks high on the list of devices calculated to give a better understanding of what happens in a crash—and thereby save lives. The reason is summed up in a recent report of Crash Injury Research: "The basic danger of flying is the danger of injury in an accident. . . . The dominant cause of fatal injury in a survivable crash is the danger of head injury."

Hugh De Haven, director of Crash Injury Research, and his colleagues have found by studying hundreds of accident reports that multiple fractures and even internal injuries seldom are fatal. Head injuries are almost invariably so.

With the aid of the head form catapult, which was constructed at Cornell Aeronautical Laboratory, Buffalo, N. Y., under contract with the Navy, CIR has built up evidence indicating that the human head can stand a force up to 2000 lb. during deceleration. But that finding is qualified by a big "if." The object the head strikes must be large and flat enough to distribute the force fairly evenly over the surface of the head.

► **Instrument Effects**—The one thing that worries Crash Injury Research specialists in their investigations is protruding instruments or other objects on the panel in front of the pilot. They have an effect similar to a spike. Smooth out the panel, construct it of material that collapses sufficiently and gradually, and the possibility of fatal injury diminishes. Here are some of the catapult results that lead to that conclusion:

• At 25 fps., the head form struck a sheet of .020 aluminum alloy. The sheet collapsed. No damage to head form.

• At same velocity, the form struck a sheet of aluminum .032 thick, with partial collapse of the panel, no injury to head form.

• At 25 fps., the form struck a sheet of 24 ST aluminum ½ in. thick. Slight injury to head form.

• At 50 fps., the form struck a 6 in. thick block of foam plastic. The plastic collapsed to 5 in. No damage to head form.

► **Background**—Crash Injury Research started during the war under the auspices of the National Research Council and was financed after the war by Navy, Civil Aeronautics Administration and Aircraft Owners and Pilots Association. It consistently has operated on a phenomenally low budget ($20,500 for one particular year). It now is under direction of Cornell under contract with the Navy.

CIR concentrates on determining how a pilot and his passengers can survive an accident, rather than going into the field of accident prevention. Some conclusions drawn from its research:

• Seat belts will not cause internal injuries in case of crash, generally are true life savers.

• Shoulder harness could reduce incidence of serious or fatal injuries.

• Aircraft structures should be built to absorb forces and collapse under them before those forces hit occupants.

• Pilots or passengers have survived severe crashes by pulling feet back (so rudder pedals don't break legs) and resting head on arms placed on structure in front.

Delta DC-6 Delivery

Delta Air Lines expects to take delivery on the first of its five DC-6s around Sept. 29 and hopes to have the entire fleet by the end of the year. The planes were ordered last February.

AVIATION CALENDAR

Sept. 2-4—National Flying Farmers Association convention, Ohio State University, Columbus.
Sept. 4-5—National Air Races, Cleveland.
Sept. 5-11—Seventh International Congress of Applied Mechanics, Imperial College of Science and Technology, South Kensington, London, England.
Sept. 6—ICAO Air Navigation Committee, Montreal.
Sept. 7—ICAO Council fifth session, Montreal.
Sept. 7—ICAO Air Transport Committee, Montreal.
Sept. 7-12—SBAC aircraft show and display, Farnborough, England.
Sept. 9—IATA legal committee, Brussels.
Sept. 11-12—Second Annual AOPA Summer Round-Up Flight, Rehoboth Beach, Del.
Sept. 12—Oakland Aviation Day, Municipal Airport, Oakland, Calif.
Sept. 13—IATA executive committee, Brussels.
Sept. 13-17—National Instrument Conference, Instrument Society of America, Convention Hall, Philadelphia.
Sept. 14-16—AIA Airworthiness Requirements Technical Committee Joint Division Meeting, Chicago.
Sept. 14-18—IATA fourth annual general meeting, Brussels.
Sept. 17-19—First annual convention, Fourteenth Air Force Association, Biltmore Hotel, Dayton, Ohio.
Sept. 18-23—Twelfth International Convention, Northwest Aviation Planning Council, Vancouver, B. C.
Sept. 20—IATA executive committee, Brussels.
Sept. 24-26—Air Force Association National Convention, Hotel Commodore, New York.
Oct. 5-8—National Association of State Aviation Officials, Copley Plaza, Boston.
Oct. 6-8—Society of Automotive Engineers aeronautic meeting, Biltmore Hotel, Los Angeles.
Oct. 14—Annual Air Line Dispatchers Association convention, Edgewater Beach Hotel, Chicago, Ill.
Oct. 18-24—International aircraft exhibit, Royal Danish Aeronautical Society, Copenhagen.
Oct. 17-21—National Aviation Clinic, Detroit.
Oct. 20-21—National Safety Council Air Transport Section, Hotel Stevens, Chicago.
Oct. 21-22—Society of Automotive Engineers production meeting, Statler Hotel, Cleveland.
Oct. 22-23—4th Annual Arizona Aviation Conference, sponsored by Chamber of Commerce, Prescott.
Oct. 25-26—Third Annual Indiana Aviation Conference, Purdue University, Lafayette, Ind.
Nov. 4-5—Society of Automotive Engineers, fuels and lubricants meeting, Mayo Hotel, Tulsa, Okla.
Nov. 9—ICAO operations division, Montreal.
Nov. 15-17—Aviation Distributors and Manufacturers Assn. sixth annual meeting, Hotel Statler, Cleveland.
Nov. 16-17—National Aviation Trades Assn., annual meeting, Allerton Hotel, Cleveland.
Nov. 16—ICAO airworthiness division, Montreal.
Nov. 13-18—National Association of Travel Officials, Miami Beach.
Nov. 23—ICAO southeast Asia regional air navigation meeting, New Delhi.
Dec. 2-5—Fourth annual international aviation celebration, El Paso.
Dec. 17—Annual Wright Brothers Lecture, Institute of the Aeronautical Sciences, U. S. Chamber of Commerce Bldg., Washington, D. C.
Jan. 10-14, 1949—Society of Automotive Engineers, Annual Meeting and Engineering Display, Hotel Book-Cadillac, Detroit, Mich.
Feb. 8—ICAO Operations Division, Montreal.

INDUSTRY OBSERVER

► Air Materiel Command has completed laboratory tests on the special magnesium wing designed for the Lockheed F-80. The new wing will be installed on an F-80 for extensive flight service tests. Plane will be flown in Alaska, Arizona and the Canal Zone to provide frigid, alkaline and tropic marine conditions. Wing is fabricated from a magnesium-zirconium alloy and employs a much thicker skin than conventional aluminum alloy wings while having a comparable weight. Skin thickness provides rigidity essential for high speed flight.

► Bristol Brabazon 1 transport fuselage and wing have been mated and final installation has begun. The 125 ton plane is scheduled to make its first flight in November.

► NACA Langley Memorial Aeronautical Laboratory has completed the 4 ft. by 4 ft. supersonic tunnel and calibration tests are now under way. The fastest large supersonic tunnel now in operation, the facility will operate at Mach number 2.2 under continuous conditions. The tunnel incorporates an air drying and refrigerating unit which cools the air from 250 to about 100 deg. F. Actual research in the tunnel will get under way next spring.

► McDonnell Aircraft Corp. has purchased one-half of Convair's one-third interest in the Southern California Cooperative Wind Tunnel to insure M.A.C. participation in tunnel testing usage for research on new aircraft and missiles. The tunnel is located in Pasadena, Calif. and is operated by the California Institute of Technology. It was built and is financed jointly by Douglas Aircraft, which has a one-third interest, and Lockheed, North American, Convair and McDonnell, each with one-sixth interests. Although the tunnel has cost about three million dollars to date, participating companies regard their investments as a saving in the long run on wind tunnel research costs.

► Fuselage dive brake tests on North American F-86A have proved the device satisfactory and one of the most effective such installations yet flight tested. Airspeed of the swept wing fighter can be held to as low as 350 mph. in steep dives with fuselage brakes extended. Prototype has reached sonic speed in dives with the brakes retracted.

► McDonnell Aircraft expects the XF-85 flight test program at Muroc Air Force Base, Calif., to require the present staff of 38 men for six months to a year. Crew will remain at Muroc to process the XF-85 as a penetration fighter. Muroc is rapidly becoming a major residential area with more than 1200 officers, enlisted men and civilians.

► Air Force has now developed remote control mechanism for its JB-2 buzz bomb. The JB-2 is an improved version of the original German V-1, pulse-jet powered missile and can be remotely controlled from a mother plane or ground station up to 150 miles.

► Two deaths have already occurred as a result of preparations for the coming 1948 Goodyear Trophy Race at Cleveland for specially designed light planes. Mike Argander lost his life in the crash of Art Chester's 1947 "Swee' Pea" at Rosemead Airport, Los Angeles County, Calif. Dwight Dempster was killed in the crash of an Eddie Allenbaugh special at Metropolitan Airport, Van Nuys, Calif. The plane featured a pusher propeller installation with the pilot located in the nose in a reclining position.

► Qualified observers at Handley-Page are afraid the Hermes IV may be heading for another Tudor fiasco. Reports of high stalling speed, one of the Tudor's difficulties, will mean long takeoff and landing runs and high landing speeds. Pilots report that the controls of the Hermes IV are excessively heavy.

► Douglas C-124 will be able to accommodate 222 troops on its two decks. As a hospital plane it will carry 123 litter patients, 45 ambulatory cases and 15 nurses. Its cargo capacity of 50,000 lb. over a range of 2500 miles will accommodate the largest items of equipment, such as tanks, bulldozers, etc., that have ever been carried aloft.

► Air Force is still pondering over 60 different Douglas design studies for the X-3 supersonic research airplane capable of reaching Mach number 3.0 and attaining altitudes in the 200-300,000 ft. bracket. The studies range from stubby, blunt-nosed designs to long, slender fuselages with sharp bullet-like nose and tail. Powerplants include ramjet, pulsejet and turbojet singly and in combination.

ENGINEERING & PRODUCTION

Manufacturers Push Cargo Planes

With two airlines showing active interest in buying, competition builds up between aircraft companies.

By William Kroger

Efforts to get federal help in development of cargo planes are being stepped up despite the fact that some manufacturers turned thumbs down on the original Congressional proposal for a federally financed commercial plane development program.

In manufacturing circles there seems to be a new urgency attached to cargo plane development. It apparently is inspired by two things: a feeling that the Berlin airlift has so dramatized the need for cargo planes that the government is going to be forced to go in the market for such planes, and the booming cargo business that has pushed at least two big airfreight operators into active interest in the purchase of cargo planes.

The two operators are American Airlines and Slick Airways. They are eyeing each other's cargo craft plans cautiously, each afraid to make the first move. Out for the Slick and AA business are two manufacturers in particular—Douglas, with its DC-6A Air freighter and Curtiss-Wright with its CW-32.

► **Curtiss Wants Aid**—Curtiss is pushing the CW-32 with renewed aggressiveness and this may have been a factor in the recently announced Douglas decision to build the DC-6A despite lack of firm orders. Douglas has at least one possibility of gain by that decision. CW is sticking by its determination not to go into the commercial field unless the original development is underwritten by military contracts.

That leaves the possibility that Douglas could offer a completed cargo plane to Slick and American before CW could get the government contracts it wants. In that event it is conceivable that Douglas could get the cream of the commercial cargo plane business beforehand.

Another factor that may have influenced the Douglas decision is the argument that constitutes one of CW's strong selling points to the Air Force and the inter-agency group set up to blueprint a federally financed plane development program (AVIATION WEEK, Aug. 16). This is that the advance work that CW has done on its cargo plane will make it possible to deliver completed CW-32s at least a year ahead of any other cargo plane that might be authorized by a government prototype program.

► **Curtiss Progress**—Curtiss-Wright has put about $1 million into the CW-32, has completed 450 hours of wind tunnel work, finished 33 percent of total engineering, has 10 percent of all scheduled drawings completed and ready for release for construction, and has built a complete mock-up.

Douglas, which hopes to fly the DC-6A early next year, perhaps can claim even greater progress. But the point that CW belabors is that the Douglas Airfreighter, as well as any cargo version of Boeing's Stratocruiser, is a conversion of a basic passenger type, while the CW-32 was designed from scratch as a cargo plane that would be just as useful commercially as to the military.

Curtiss-Wright has shown the mock-up to the Air Force and Army Field Forces and pressed as hard as it can for military orders. But it has put about as much time and effort into studies to show the CW-32's commercial possibilities.

► **New Survey**—Quietly being circulated by CW among interested operators is a fact-jammed survey of cargo operations, based in large measure on existing services, that ticks off the capabilities of the CW-32, and three other planes A, B and C, which obviously are the Stratocruiser, the DC-6 and DC-4. The last is included because so many passenger DC-4s are being "retired" to cargo use.

The survey, which claims to take each manufacturer's own performance figures as a base, compares the four types of planes when used in fleets on cargo service between Newark, Detroit, Chicago, Los Angeles and San Francisco. A 65 percent load factor is used, and daily utilization approximates 7.5 hours. The results:

• **CW-32**—Twelve planes costing total of $9,419,000 fly 6,980,000 ton miles a month. Direct operating cost 7.44 cents per ton mile, $519,628 per month.

• **Stratocruiser**—Ten planes costing total of $14,652,800 fly 6,660,000 ton miles a month. Direct operating cost 10.30 cents per ton miles, $679,988 per month.

• **DC-6**—Fourteen planes costing total of $11,704,000 fly 7,070,000 ton miles a month. Direct operating cost 8.77 cents per ton mile, $619,764 per month.

• **DC-4**—Twenty-seven planes costing total of $8,562,250 fly 6,645,000 ton miles a month. Direct operating cost 11.46 cents per ton mile, $761,221 per month.

Some other calculations used in the comparison are: payload, 35,840 lb. (CW-32), 39,000 lb. (Stratocruiser), 28,885 lb. (DC-6), 18,000 lb. (DC-4); system block speed, 250 mph. (CW-32), 280 mph. (Stratocruiser), 274 mph. (DC-6), 194 (DC-4), and maximum range with full payload, 1320 mi. (CW-32), 1210 mi. (Stratocruiser), 1610 mi. (DC-6), and 1500 mi. (DC-4).

► **Compound Engines**—Curtiss-Wright is still planning to use four Pratt & Whitney R-2800 engines in the high-wing CW-32, primarily because its two likeliest prospects use the same basic engines—American in the DC-6 and Convair-Liner; Slick in the C-46. However, Curtiss would like to put its own Wright R-3350 compound engine (C18C11) in a military CW-32. This, the company claims, would permit a cruising speed at 20,000 ft. of better than 300 mph. with a gross load of 120,000 lb., as against a cruising speed of 253 mph. at a normal gross of about 104,000 lb. with R-2800 engines.

New Boost for Plane Standardization

The growing program of standardization in the aircraft manufacturing industry is being given further impetus on two widely separated fronts.

Representatives of six West Coast companies convened recently at the Boeing Airplane Co. plant in Seattle for the 103rd meeting of the western division of the National Aircraft Standards Committee and outlined duties of a new steering committee which will seek to form one set of airplane standards where two or more exist.

In East Hartford, Conn., Pratt & Whitney Aircraft has announced results of its own standardization program, designed to promote efficiency, control quality and reduce inventories. Considerable progress has been reported in the last three years.

► **Different Standards** — According to John F. Cramer, Boeing standards unit chief and chairman of the western conference, one class of standards and specifications is maintained for the Air Force and Navy and another for com-

mercial work. The committee, with members from each group, will attempt to consolidate all three. Accomplishment of this task is expected to result in appreciable savings in materials, time and effort.

Douglas Aircraft Co., Consolidated Vultee Aircraft Corp., Lockheed Aircraft Corp., North American Aviation, Inc., Northrop Aircraft, Inc., and Boeing were represented at the meeting.

Illustrating the success of Pratt & Whitney's program is the fact that the 31 different sizes of metal pins needed for aircraft manufacture have been reduced to seven.

►**Credit Split**—Interdepartmental and employe cooperation is given credit for the progress made as well as work of the production engineering department, which collates requirements of both engineering and production groups.

Convair Appoints New Sales Manager

The continuing personnel reshuffle at Consolidated Vultee Aircraft Corp. has brought the appointment of Harold D. Koontz as manager of airline sales.

Koontz formerly was assistant to the president of Trans World Airlines. The former president of IWA, LaMotte Cohu, is now president and general manager of Convair.

Koontz has had extensive experience in the fields of airline and railroad transportation, economics, government, and education. In 1944 and 1945, he was in charge of a research program for the Association of American Railroads, and for two years during the war he was chief of the Traffic Branch, Office of Civilian Requirements, WPB.

In other personnel actions:

Electric Boat Co.—New York City, has elected two new directors, Morehead Patterson president and chairman of the board of American Machine and Foundry Co., and Clifton M. Miller, former partner of Dillon, Read & Co. and White, Weld & Co.

Monsanto Chemical Co.—St. Louis 4, Mo., appointed Jonathan R. Spiague, Jr., technical representative in Washington, D. C., and James B. Irwin, Jr., assistant to the president, succeeding R. U. Haslanger.

Kaman Aircraft Corp.—Windsor Locks, Conn., named J. Lee Rieseler to direct development and use of electronic devices and methods for measuring and recording stresses in helicopter rotors during flight. He is a nationally known electronics engineer and was with Hamilton Standard Propellers during the war.

New Departure Div., General Motors Corp., Bristol, Conn., appointed Frank J. Miller general sales manager. He succeed Lester G. Sigourney, retiring after 40 years with the division. William T. Mulden is transferred to Meriden, Conn., as resident manager of the division plant there.

Air Associates Profit

Net income of Air Associates, Inc., was $3110 for the quarter ended June 30. AVIATION WEEK previously reported the figure erroneously as $110.

BRIEFING PRODUCTION NEWS

►**Boeing Airplane Co.**, Seattle, delivered 27 B-50 bombers and three YC-97 Stratofreighters to the Air Force during the first six months of 1948, President William M. Allen stated in the company's semi-annual report. (Strategic Air Command reports only four B-50s accepted, with the others returned for modification.)

►**Frederic Flader, Inc.**, Buffalo, discloses development of a small turbojet engine, XJ-55-FF-1, for the Air Force. If the engine could be released for civilian use, Flader claims it would be suitable for personal plane installations.

►**Lear Inc.**, Grand Rapids, Mich., reports orders totaling $900,000 from six aircraft manufacturers. Backlog for electro-mechanical equipment and accessories has doubled in six months. New contracts include screwjacks, electric motors, electronic controls, autopilots, gyro instruments, automatic positioner controls and automatic temperature controls for jet planes.

►**Northrop Aircraft Inc.**, Hawthorne, Calif., is seeking 400 additional engineers, including aerodynamicists, stress engineers and advanced designers. Engineering payroll is now 1100, far above the wartime peak of 650.

►**Lundy Manufacturing Corp.**, New York City, has bought tools, equipment and manufacturing rights to Aeromotors of the E1Y series from Dumore Co. of Racine, Wisc. Motors are 1/6, 1/8, 1/10 and 1/20 hp., 12 or 24 volt d.c., with speeds ranging from 200 to 10,000 rpm.

►**Bendix Aviation Corp.** has bought from the War Assets Administration two aircraft parts plants at South Bend that it used during the war. Original cost of the plants was $1,578,000, sale price was $1,050,000.

►**Bell Aircraft Corp.**, Buffalo, has appointed de Havilland Aircraft of Canada to handle sales and service of Bell helicopters in Canada, Newfoundland and Labrador.

►**Aeromatic Propellers** department of Koppers Co., Baltimore, Md., is included in a merger of two Koppers divisions to form a new Metal Products division. The former piston ring division was joined with the shops division, which manufactured Aeromatic props.

►**Pratt & Whitney Aircraft** division of United Aircraft Corp., East Hartford, Conn., has begun construction of its gas turbine laboratory on the bank of the Connecticut River. Most of the excavation and rough grading are completed, and foundation forms are being put in place.

►**Fairchild Engine & Airplane Corp.**, New York City, has licensed Wellworthy Piston Rings, Ltd., Lymington, Hampshire, England, to use the Fairchild Al-Fin process for bonding aluminum to other metals. While this is the first foreign license for Al-Fin, it is the fourth such agreement granted in recent months.

►**Westinghouse Electric Corp.** expects to employ from 1500 to 2000 persons in jet engine production at the Kansas City, Mo., plant it will operate for the Navy. The plant was used during World War II by Pratt & Whitney Aircraft. Eventual employment may be 5000.

►**Standard-Thomson Corp.**, Dayton, Ohio, has developed a new type of heat exchanger for use in jet planes. S-T's Clifford Manufacturing division at Waltham and Boston, Mass., is in volume production of the new exchanger for the Air Force.

►**Howard Foundry Co.**, Chicago, Ill., has purchased the Dalmo-Victor magnesium foundry, Belmont, Calif., which manufacturers a wide range of magnesium aircraft castings. This brings the number of Howard foundries to six, located in Chicago and Los Angeles in addition to Belmont.

►**Walter Kidde & Co.**, Belleville, N. J., manufacturer of fire extinguishing equipment, has set up new agencies in Haiti and Panama, giving the company outlets in all Caribbean and Central American countries except Nicaragua and Costa Rica.

►**Aeroquip Corp.**, Jackson, Mich., has licensed Aero-Coupling Corp., Burbank, Calif., to handle its line of hose fittings and flexible hose lines for aircraft.

Constitution transport taxies in at Naval Air Station, Patuxent, Md., after 2600 mi., non-stop flight from Moffet Field, Calif.

Design Analysis

Lockheed Constitution Transport

Spaciousness, comfort keynote long-range passenger version. Ingenious engineering features mark design.

By Robert McLarren

An inspection of the Lockheed Constitution transport discloses a truly noteworthy technical and artistic achievement in aircraft design.

It is the first transport airplane ever designed and built for Navy specifications.

The Lockheed Model 89 actually began as a commercial airliner in the Fall of 1942, when Pan American Airways and Lockheed engineers began studies of a newer, larger type to supersede the Model 49 Constellation.

This original specification included a 20,000-lb. payload (passengers and cargo), range of 4500 mi., cruising speed of 250-275 mph. at 25,000 ft., and top speed of more than 300 mph.

Layouts were agreed upon during the Fall and in January, 1943 detail design drafting was begun by a small group of 15 Lockheed engineers spared from the pressing projects—the P-38, P-49, P-58, P-80, PV-2, P2V, R50 and others.

In the Spring of 1943, the growing Navy logistics problem in the Pacific precipitated Bureau of Aeronautics interest in the project, and after careful study of specifications and engineering drawings, BuAer awarded Lockheed a contract for the construction of 50 Constitution transports at a cost of $111,250,000.

The new plane was designated XR60-1 and Lockheed's vice-president-engineering, Hall L. Hibbard, assigning 40 more engineers to the project, gave it a priority comparable to the other military projects on the boards.

▶**First Flight Test**—On V-J Day, however, the R60 program was reexamined and cut back to only two airplanes to cost $27,000,000, including engineering, static test and flight tests.

First airplane was completed in the Summer of 1946 and subjected to static test limit loads on major structure and failing loads on smaller assemblies.

This work was carried out in a special $1,250,000 hangar, 408 ft. long, 302 ft. wide, as high as a six-story office building, and covering four acres.

After completion of these static tests, assembly and installation was completed, and the prototype made its first test flight from Lockheed Air Terminal, Burbank, Calif., on Nov. 9, 1946. Joe Towle, chief service test pilot, was at the wheel, with Tony LeVier, chief experimental test pilot, as copilot.

The huge craft got off in 27 sec., using 1820 ft. of runway, and made a leisurely flight to Muroc Air Force Base, Calif., covering about 400 mi. in the process, although the Burbank-Muroc airline distance is only about 60 mi.

▶**Test Program**—The elaborate flight test program got under way immediately, with 54 tanks—each with a capacity of 1100 lb. of water—mounted on the craft's upper deck.

By pumping this water fore and aft the plane's C.G. could be altered quickly and over a wide range.

The craft was equipped with the most complete instrumentation ever carried. Motion picture cameras, rigged facing the batteries of dials, recorded readings throughout each flight.

Although the No. 1 airplane has undergone almost two years of testing by Lockheed engineers, it is slated for delivery to the Naval Air Test Center, Patuxent River, Md., for extensive additional tests by Naval personnel. Following these tests it will enter service as a straight cargo carrier.

▶**Passenger Version**—Meanwhile, ship No. 2 was completed as a luxury passenger version with cargo space on the lower deck only.

It was completely outfitted during construction so that it would be ready for immediate service upon delivery. It was flown for the first time June 9, 1948, and on July 25 made a non-stop flight from Moffett Field, Calif. to Patuxent River, Md., covering the 2600 mi. in 10 hr. 20 min., with a crew of 35—23 Navy and 12 Lockheed personnel.

The huge plane was formally christened by Mrs. John L. Sullivan, wife of the Navy Secretary, on July 29 at Washington National Airport. It will enter operational service as a luxury personnel transport with provisions for 92 passengers on the upper deck, 7375 cu. ft. (40,000 lb.) of cargo space on the lower deck, and a crew of 12 (six on duty, six off).

▶**Fuselage**—The Constitution fuselage is 156 ft. long and uses a "double bubble" or "figure 8" cross-section, the first craft to use bubbles of equal diameter.

This configuration, actually the 28th version of the original, results from the pressurization requirement, since a perfect cylindrical form affords the most efficient structure for withstanding internal pressure.

However, a single cylinder the size of the Constitution fuselage would have resulted in an excessive amount of waste space for internal stowage.

By utilizing two circle segments, separated by the main floor, this waste space was cut in half.

▶**Compartmentation**—The fuselage is divided into a nose wheel compartment, forward lower cargo deck, rear lower cargo deck, flight deck, and passenger and aft fuselage compartments.

All areas, with exception of the nose wheel space and aft fuselage compartment, are pressurized.

The 12-man crew consists of a captain, pilot, copilot, flight engineer, assistant flight engineer, radio operator, navigator, two flight orderlies and three relief crewmen.

Pilot and copilot seats are forward on the flight deck, with conventional flight controls and a control pedestal located between them.

The cabin is simple and devoid of other than flight instruments and flight controls. A nose gear steering wheel is located to the left of pilot's knee.

Aft of copilot is the flight engineer's station with engine controls and engine instruments located on a panel in front of him. An open space below the in-

Craft's massive four-wheel, truck-type main gear required extensive research. Vanes on tire side impart precession.

This spacious well, in addition to housing craft's dual nose wheel, is forward passenger entrance. Main entrance is aft of wing.

Commodious accommodations on transport's 92-passenger upper deck. In center is [illegible]

This spiral stairway leading to lower deck.

strument panel allows him to observe the location and movements of the pilot's pedestal controls

To the right is the assistant flight engineers' seat

The radio operator is located behind pilot, the navigator behind the radio operator

Behind these compartments are the crew's quarters, and aft of these is the spacious galley with a 6-cu ft electric refrigerator, an electric range with 6 large food drawers, 2 hot plates and a griddle, and a sink with hot and cold running water

The galley permits serving of 300 hot meals per flight and includes cabinets for the storage of dishes, linens, utensils and canned food

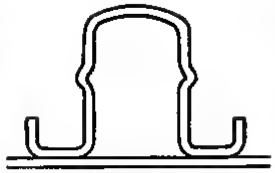
▶**Passenger Accommodations** — Main passenger deck is entered either through a forward or central spiral staircase and accommodates 92

Seats are arranged three on the right and two on the left of a wide aisle It is decorated in a light gray with rugs, seat upholstery and trim in Navy blue

On the forward bulkhead, above the staircase, is a permanent glass case containing a scale model of the original U S S Constitution

Lounges are spacious and well appointed, the men's lounge is forward and measures 9×8 ft., the women's lounge is aft and measures 9×10 ft

The lower deck can be fitted to accommodate 76 passengers—41 in the forward compartment and 35 aft The separate compartments are created by the main wing spars passing through the fuselage but a low passageway connects the two



Special spanwise stiffener form developed for Constitution wing provides improved height for greater moment of inertia, and leg joggles afford stability under load.

Passengers may be loaded either through the nose wheel well or through the main door aft of the wing trailing edge

▶**Cargo Facilities**—Cargo may be loaded through large, power-operated 106×74 in doors, on the lower forward deck with the aid of two electrically operated hoists having a combined lifting power of 10,000 lb

These hoists are easily detached and may be used in pairs on either side of one door or singly with each door

The floor loading has been designed for a static load of 300 lb per sq ft,—highest of any U S landplane Floor areas are carefully stenciled with correct floor load data pertinent to floor strength and airplane balance requirements. There are 80 in between floor and ceiling on the lower deck, 89 in clearance on upper deck

Cargo compartment will accommodate more jeeps than a railroad freight car and has provisions for standard Navy and Air Force engine cradles And there are special tiedowns and brackets for litter tiers, troop seats and a variety of cargo items

▶**Wing**—The Constitution wing uses a special profile developed by Holley Dickinson, Lockheed aerodynamicist, with a 20 percent thickness at the root, 12 percent at the tip

It is built up of 7 assemblies—2 tip sections, 2 outer panels, 2 inner panels and a fuselage section consisting of spars and upper surface only

Utilized is a conventional two spar structure with pressed-flange ribs and special hat section spanwise stiffeners

Inner wing panels accommodate 2 integral fuel tanks, 2 power plant units and 5 interchangeable flap segments Outer wing panels carry the ailerons

Wing area is 3610 sq ft, flap area, 400 sq ft The flaps are development of the famed design of Harlan D Fowler and have undergone considerable evolution since Lockheed first used them on the prewar Model 14 Track guides are now substantially flush, in contrast to the large fairing assemblies required on early designs

Wing leading edge encloses a hot-air duct for anti-icing

▶**Empennage**—Full cantilever vertical and horizontal stabilizers with exceptionally high aspect ratio form are used

Fin is bolted to the fuselage to permit removal

Rudder and elevators are metal-covered and equipped with controllable trim tabs along the trailing edge

Static balance of the rudder features an unusual system Instead of bolting a series of small lead weights along the rudder leading edge, as in conventional practice, Lockheed engineers designed a single, long beam bolted to the bottom of the rudder torque tube within the fuselage, projecting forward with a single weight attached to its leading edge

This weight is actually considerably less than that the old method would have required, because of the long moment arm of the beam as compared to the very short moment arms of the weights mounted along the leading edge of other control surfaces

Although the empennage appears small, the combination of power-boosted controls and high aspect ratio surfaces renders the areas ample

▶**Surface Controls**—It was apparent, early in the Constitution design, that surface controls would require special attention to three major requirements—boost, low friction and low deflection Friction was reduced to a minimum by the use of long, straight runs, which eliminated numerous pulleys Empennage cables extend 127 ft without a bend, and similarly, aileron cables run 68 ft

Deflection was minimized with cable

LOCKHEED CONSTITUTION

Lockheed Model 89 — **Navy Model XR60-1**

Four P&W R 4360 22W 3500-hp engines

Span	189 ft 1¼ in
Length	156 ft 1 in
Height	50 ft 4¼ in
Wing area	3610 sq ft
Empty weight	113,780 lb
Normal gross weight	184,000 lb
Normal landing weight	160,000 lb
Top speed	303 mph @ 25,000 ft
Cruising speed (normal gross)	260 mph @ 25,000 ft
(reduced weight)	285 mph @ 25,000 ft
Stalling speed	78 mph
Rate-of-climb (normal gross)	700 fpm
(reduced weight)	1000 fpm
Service ceiling	28,600 ft
Range (normal gross)	5390 mi
(maximum)	6700 mi

Project engineers: Lockheed, W A Pulver
BuAer, Comdr E L Simpson, Jr., USN
Commanding flight crew: Comdr W M Collins, USN

Wise money rides on the champ

THE odds favor the champion The champion got to the top by fighting his way there, by beating all challengers That's why, in each new battle, the wise money is placed on the champ

The champion has a record of successes; he has wise handlers who carry him through to *more* successes

For this same reason, it does not pay to play hunches in your selection of alloy steels Carilloy steels have a record of exceptional performance under all kinds of unusual conditions And Carilloy's handlers — the Carilloy metallurgical engineers — are recognized authorities in the field of alloy steels

When these engineers size up the job you have to do, they bring with them years of experience in the highly specialized field of alloy steel application And they play no favorites because they have a complete list of fine alloy steels to pick from—bearing steels, aircraft steels, gear steels, Nitralloy steels, high temperature steels and low temperature steels, regular and special analysis steels of every kind In any form and in any size.

So if your job requires the unusual in strength, toughness, durability, stamina, fabricating qualities—get their expert opinion. They'll help you pick the alloy steel that's right for the job and that you can put your money on with confidence

U-S-S Metallurgical Engineers and the outstanding research organization behind them have played a leading part in the development of the triple alloy NE steels, and in the inception and introduction of hardenability bands, isothermal transformation studies, and new and improved heat treating methods Through constant research and experiment these experts are continually expanding the usefulness and efficiency of special steels for the special jobs of industry

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH AND CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON AND RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS COAST TO COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

UNITED STATES STEEL

Flight steward's simple desk carries only light indicators, cabin air controls, and telephone

Lockheed-designed crane speeds cargo work.

tension regulators, which maintain the predetermined rigging load at all times, compensating for temperature differences, as well as fuselage and wing deflection, etc

A boost system is used incorporating two salient characteristics—sensitivity control and reliability

Reliability is obtained through use of three separate hydraulic systems, on any one of which the elevator can be boosted, and on any two the ailerons and rudder boosted Normally, all three are used Coordination of these systems is obtained with three booster units on the elevator system, two each on the ailerons and rudders

Control surface gust locks are installed internally and will sustain a 70 ft per sec gust loading

►**Landing Gear**—It was determined from the start that the Constitution must be able to operate on all scheduled airline airports of CAA Class 4 and larger

The first four-wheel, truck-type landing gear, arranged in tandem, to be used on an airplane was designed for the 92 ton craft

Though simple in appearance, the gear required more than 50,000 engineering man-hours for research and development

Each pair of wheels is supported by a single shock strut extending upward to the longitudinal torque tube which folds the entire gear inboard into the wing

Retraction is hydraulic through a 12 in arm on the torque tube connected to the hydraulic actuating strut within the wing

Each wheel is fitted with dual, expander tube hydraulic brake, with individual brake systems for forward and rear pairs

Transmission of hydraulic pressure down the long main gear struts is obtained with a unique expander tube This consists of a tube and sleeve assembly operating similarly to the conventional hydraulic strut except that hydraulic pressure rather than mechanical pressure is obtained at the lower end of the installation

A heavy tail-skid lowers and retracts with the main gear It is fitted with a hydraulic shock strut to absorb impact, but in all tests thus far, it has never been used

Dual nose-wheel gear utilizes levered suspension to obtain stability at high speed, the wheel axles being mounted on a trundle aft of the main gear axis Shimmy dampening is provided The nose gear folds forward and is sealed, upon retraction, by large clamshell doors

►**Wheel Turning**—Each main wheel tire is equipped with "elephant ear" vanes, which extend under air pressure on the forward and lower side of the tire and are flattened on the rearward and upper side, to impart pre-rotation as the gear is extended and the final approach entered

Shortly before the touchdown, a 2-hp d c motor in each wheel is actuated to accelerate the wheel to the 80 90 mph landing speed Initial pre-rotation imparted by the tire flaps reduces substantially the load on the electric motors

Since the wheels are turning at approximately landing speed and the pilot sits so high in the air, a special light is mounted on the instrument panel to indicate when the plane touches the runway

►**Hydraulic System**—This system operates landing gear, brakes, flaps, control boost, and nose wheel steering It is a 3000 psi installation with a 20 gal reservoir for the main system and 2½ gal for booster system

Each engine is fitted with three hydraulic pumps, two of which are ganged from a single drive pad

►**Power Plants**—Four Pratt & Whitney R-4360-22W Wasp Major engines equipped with turbosuperchargers power the Constitution These 28-cyl, air-cooled engines each develop 3500 hp for takeoff and are equipped with water-injection They replace R-4360-18 engines of 3000 hp originally installed, and the change reduced the takeoff distance of the airplane

Engines are mounted in identical interchangeable nacelles and each can be removed and reinstalled in one hour by a four-man crew

Alternate sources of carburetor air are provided—altitude cruising and special takeoff duct systems

The cruising system takes air aboard through cowl leading edge inlets, passes it through the turbosupercharger (where it is compressed and heated), through an intercooler, and thence into the carburetor

Since the turbosupercharger is not normally used for takeoff (or below 8000 ft), a special airscoop is mounted atop each nacelle, leading through a short, 90-deg bend and directly into the carburetor By shortening the air intake distance, thereby cutting duct losses, ram pressure to the carburetor is considerably increased In conjunction with this system, a special bypass directs the exhaust gases directly into the atmosphere from behind the cowl flaps, bypassing the turbosupercharger and thereby reducing exhaust back-pressure

In combination, these two "short" systems add about 200 hp to each engine, or 800 hp in all In a first flight test of the systems at an airplane gross weight of 164,000 lb the Constitution was airborne after a run of only 1503 ft, reached a height of 50 ft in a distance of 2780 ft

Engine exhaust is directed through a heat exchanger to provide hot air for the wing and empennage leading edge anti-icing systems as well as for cabin heating

The engines drive four-blade, 16-ft 8-in, full-feathering Curtiss Electric propellers Each driving motor is enclosed in a streamlined metal spinner and blade root cuffs are installed The two inboard propellers are full-reversible and can stop the craft without use of wheel brakes Normal landing distance over a 50-ft obstacle is 2300 ft

►**Fuel System**—Fuel is carried in four large integral tanks within the wing box beam. Inboard tanks each have a capacity of 2650 gal., each outboard tank 2240 gal, a total capacity of 9780 gal

Lockheed avoided the classic complexity of large aircraft fuel systems by eliminating inter-tank fuel pumping and retaining only tank cross feeds As a result, although fuel cannot be pumped from one tank to the other, any engine can be fed from any tank

Necessity for inter-tank pumping was obviated by making the entire wing box beam a fuel area, changes in airplane longitudinal trim being accommodated by the level-seeking characteristic of liquid

►**Oil System**—Each nacelle contains a 50-gal oil reservoir for its engine In addition, a special 200-gal oil tank is carried in the fuselage to provide engine lubrication on extended-range operations

Each nacelle contains its own oil coolers and oil temperature regulator, which is automatic in operation

The Constitution has five centralized lubricating systems, one for each main gear unit, one for the nose gear and two for the wing flap system Grease can be pumped to all working parts of these systems in flight

►**Cabin Conditioning**—Fuselage is designed to withstand a normal operating pressure differential of 4·67 psi permitting flight at 25,000 ft while the cabin is held to 10,000 ft atmospheric conditions

There are 24,000 cu ft of pressurized volume in the fuselage Pressurized air is bled from the engine turbosupercharger systems and ducted to a 7½ hp electric blower for distribution through the various pressurized areas

A portion of the air is recirculated through a battery of deodorizing filters containing activated charcoal for purifying

Air outlets in the cabin are through "anemostat" units, which diffuse the flow to provide "no draft" circulation Each compartment is equipped with an individual thermostat which controls the temperature of only the immediate area, to satisfy local requirements

One long-standing airline passenger complaint has been answered—the cabin blower is operative on the ground without engines running, providing ventilation in the plane prior to engine starting and departure

At altitudes lower than 8,000 ft, cabin air is taken from wing leading edge inlets

Cabin heat is provided by the thermal anti-icing system heat exchangers in the engine exhaust system.

►**Electrical System**—Three power supply systems are used—a 110v d c, a 28v d c, and a battery system

The 110v system is supplied by four 15-kw generators mounted one on each engine This system supplies power for cabin lighting, galley operation, the 7½ hp cabin air blower and the pre rotation wheel motors It also supplies a 110v d c converter producing 400-c a c for the remote-indicating instrument systems

The 28v d c system is powered by four 200-amp, 28v generators mounted one on each engine This system supplies the four engine starters and the electric cargo hoists

Battery system consists of five 34-amp hr batteries which provide 24 hr of emergency radio power—constant receiver operation and transmitter operation on a 10 min-on, 10 min-off cycle The battery system will provide power for loading of 40,000 lb of cargo followed by the starting of all four engines

Flaps have an emergency electrical operating system

About 2000 lb of radio and radar equipment are carried, the radar spinner and modulator unit being located in the plastic nose.

It became obvious, early in the electrical system design, that conventional wiring diagrams would require completely impractical quantities of drawings codes, symbols, etc.

The Bell Telephone Co was consulted because of their similar problem with complex wiring As a result, Lockheed adopted the Bell system in which each wire is stamped with a number, and a special pocket size code book is provided for tracing electrical leaks or shorts The system has proved practical, time-saving and virtually fool-proof.

►**Special Equipment**—Four 12-man life rafts are carried in each wing upper surface These are ejected automatically via small, recessed levers in the cabin wall Other life rafts are stored inside the fuselage when additional personnel are carried There are 13 emergency exits from the fuselage

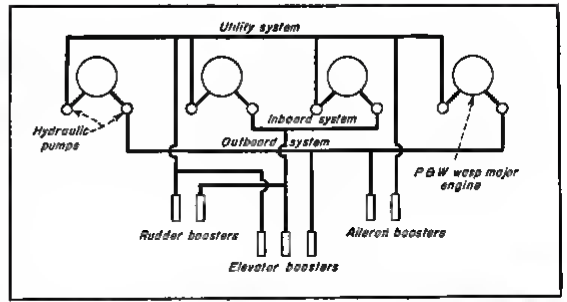
The flight engineer operates all engine controls except during takeoff and landing. He is responsible for cruise control of the airplane Assistant flight engineer controls the cabin pressurization system and all electrical controls Each electrical system is provided with a recessed circuit-breaker arranged in a neat, simple panel

The flight engineer is also equipped with special wide-angle lenses in port holes to provide vision to the four engines from his station while facing forward He has a master control which indicates fire, and a master switch on his panel feathers the propeller, shuts off the fuel, breaks electrical circuits and operates the extinguisher system in any nacelle in which fire is indicated

►**Future Developments**—The Constitution is not expected to reach operational maturity for a decade, and design studies have already been completed for a variety of improvements, when equipment becomes available.

Drawings have been completed of versions powered by Wright and Pratt & Whitney compound engines, Wright, Allison and Pratt & Whitney turboprop engines; and the British Armstrong-Siddeley Python turboprop engine. Wide varieties of interior arrangements are ready for installation.

Hall L Hibbard, Lockheed v-p and chief engineer, states flatly that the Constitution could operate commercially at the lowest cost per ton-mile or per passenger-mile of any airplane ever built



Surface control boost arrangement utilizes three hydraulic systems to provide reliability

Supersonic Role Awaits Turbojet

Important application exists for gas turbine in speed gap separating it from ramjet. Diffuser is vital factor.

Postwar Air Force fighter planes—those now flying and under construction—are designed for operation in the transonic speed zone (Mach 0.85 to 1.05). And at least one, the North American F-86, has already attained some speed in dives.

While major attention has been paid to the aerodynamics of wing, fuselage and empennage of high speed aircraft designs, engineers are now turning their attention to problems presented by the operation of conventional turbojet engines at transonic and supersonic speeds.

With respect to the engine speed spectrum, certain obvious gaps will have to be closed quickly if aircraft are to make a smooth design transition from the subsonic to the supersonic regime.

The well-known sequence of engine types in terms of aircraft speed—reciprocating, turboprop, turbojet, ramjet and rocket—contains "jumps" which are now being studied closely in an attempt to bridge them.

► **Turbojet-Ramjet Gap**—For example, the turbojet has heretofore been considered a basically subsonic power plant capable of efficient operation at speeds up to those approaching sound. For attainment of high supersonic speed, the ramjet has been proposed as the logical engine. But between the turbojet and the ramjet lies a gap of about 500 mph., which has recently become of intense interest to designers. It is in this gap, included in the zone between Mach number 1.0 and 2.0 (750 to 1500 mph.), that an important application exists for a turbojet engine capable of efficient operation.

► **Inlet Factors**—The problem of operating a turbojet engine at supersonic speed is principally one of decelerating the inlet air from supersonic to subsonic speed without prohibitive losses.

In the subsonic inlet, the air enters a straight or slightly diverging duct which converts its dynamic pressure to static pressure by slowing its speed.

In a centrifugal-flow turbojet (J-33) this air is guided into a plenum chamber from which it is taken into the engine. In the axial-flow turbojet (J-34, J-35, J-47) it is taken directly into the compressor inlet. If this inlet were to be operated at supersonic speed, the air entering the compressor would be at supersonic speed with resulting breakdown in compressor operation, unless an especially designed compressor were used.

Thus, the first problem presented is that conventional diffusers, such as are now installed on turbojet powered fighters, cannot be used efficiently for supersonic flight speeds.

► **Diffuser Shock**—To diffuse supersonic airflow, the duct must first have a convergent section, which slows the supersonic air down to sonic speed.

Immediately aft of this a divergent section is used to further reduce this sonic speed air to low subsonic speed suitable for admission to the compressor.

Since the deceleration of air from supersonic to subsonic speed creates a shock wave, a normal shock wave is formed across the diffuser at a point slightly aft of the throat.

Proper design of the diffuser may, however, reduce the losses associated with this shock wave to a practical minimum.

► **Contraction Ratio** — Primary design parameter of a supersonic diffuser is its contraction ratio, which determines the minimum Mach number at which it operates and the amount of compression the entering air undergoes before it must negotiate the normal shock.[1]

As the contraction ratio, b^2/c^2 (in which b is diameter of the circular inlet and c diameter of the throat), is increased, the minimum Mach number at which the diffuser operates is also increased. For example, a diffuser with a contraction ratio of 1.2 would require a Mach number of 1.93 to operate, while a contraction ratio of 1.35 would require Mach number 2.7 to operate.

► **Entrance, Exit Cone Angles**—After the contraction ratio of a supersonic diffuser has been fixed according to the minimum Mach number at which it must operate, two other features—entrance cone angle and exit-cone angle—must be considered.

Generally, the greater the entrance cone angle, the better the performance of the diffuser.

Typical examples of efficient entrance-cone angles used in conjunction with selected contraction ratios are 8 deg. with a CR of 1.1, 18 deg. with a CR of 1.135 and 20 deg. with a CR of 1.3, etc.

Since the boundary layer is thick behind a normal shock, pressure recovery in the divergent section of the diffuser must be slow to prevent separation and very low exit cone angles are recommended, three degrees having proved superior to larger angles in a series of tests.

Properly designed supersonic diffusers, such as those described here, can produce energy recovery of 90 per cent at speeds up to Mach 1.85, a value comparable to recoveries obtained with subsonic diffusers.

► **Diffusers Studied**—Two other types of diffusers are being investigated for use at supersonic speed but detailed design data is not yet available.

One of these is the Oswatitsch diffuser, making use of a central cone producing a series of weak oblique shocks which are reflected by a sleeve assembly. This method has also demonstrated an energy recovery of 90 percent at Mach numbers between 1.2 and 1.6.

The other and most suitable, type is a variable diffuser which can accommodate a wide variety of Mach numbers by mechanical changes in its shape. This type presents considerable design problems some of which have not yet been solved. The method will be used in a large supersonic wind tunnel now under construction and it is hoped that valuable experience will be gained in the operation of variable shape diffusers.

It is thus apparent that design data is available through the use of which efficient deceleration of inlet air from supersonic to subsonic speed may be obtained.

► **Turbine Inlet Temperature**—The basic operating limitation on a turbojet engine is the maximum turbine inlet temperature, which, in turn is a function of the amount of compression produced by the compressor.

With a constant pressure ratio, it is apparent that the temperature rise through the engine to the turbine is mainly a function of the ram compression produced by the flight velocity.

If, for example, a maximum turbine inlet temperature of 1500 F is selected, at low Mach numbers the temperature rise due to mechanical compression is small enough to permit a large amount of fuel to be burned before this limiting temperature is reached.

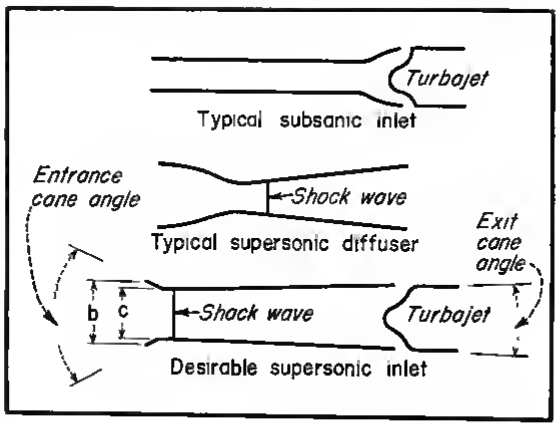
However, as the Mach number increases, the temperature due to ram compression increases and this may bring the temperature so close to the maximum permissible as to permit the burning of little or no fuel.

Calculations indicate that this condition will become serious as Mach number is increased above 1.2, and thrust will become zero at Mach number 3.0 for a pressure ratio of 4. As the pressure ratio is increased, this maximum permissible Mach number is decreased. For example, at a pressure ratio of 10 the maximum permissible Mach number has dropped to only 2.4. As a consequence of this limitation a pressure ratio of only 2 will produce essentially the same thrust at Mach numbers between 1.2 and 1.6 as that produced by much higher pressure ratios.[2]

Since the ramjet engine is not severely restricted in its maximum operating temperature (because it has no turbine), its thrust continues to increase as its ram compression increases and, for this reason, is the ideal power plant for supersonic speeds above Mach 2.0.

► **Fuel Consumption Considered**—It is on the basis of specific fuel consumption that the supersonic turbojet engine would be greatly superior to the ramjet within the former's range of effective Mach numbers.

Whereas the ramjet shows a specific fuel consumption of between 2.0 and 2.2 lb. fuel/lb. thrust/hr. at a fuel-air ratio of 30 at Mach 2.0, the turbojet has a consumption of only 1.2-1.3 lb.



fuel/lb thrust/hr using a pressure ratio of 4.0. In terms of pounds of fuel per horsepower hour, this represents a value of only 3.4-4.0, which is well below that of current reciprocating engines.

Using a pressure ratio of 2, this consumption drops to only .26 at Mach 3.0, a phenomenally low figure.

► **Turboramjet**—Most promising development in the application of the turbojet to supersonic aircraft is the addition of the after burner. This combination produces a turbojet-ramjet engine which, in many respects, attains the best features of these two power plants.

The "turboramjet" engine consists of a conventional turbojet to which an additional fuel burning stage is added aft of the turbine, thereby permitting the use of temperatures substantially higher than those permitted through the turbine.

These high temperatures increase the thrust and efficiency and thus reduce the specific fuel consumption of the engine to a point affording interesting possibilities for supersonic aircraft power.

Fuel consumption of the ramjet engine at maximum thrust is about 3.3 lb fuel/lb. thrust/hr., which is about 23 percent above the fuel consumption of the turboramjet at a flight speed of 1150 mph.*

Maximum thrust per unit engine frontal area obtainable with the ramjet is approximately 3000 lb./sq. ft., which is about 20 percent lower than that obtainable with the turboramjet engine at the same speed and altitude.

An important superiority of the turbojet and turboramjet over the supersonic ramjet engine is the inability of the latter to operate at speeds much below that of sound, making it necessary to provide launching equipment for aircraft and missiles so powered.

Both of the turbine engines, of course, provide power for takeoff and permit safe and comparatively simple handling of the airplane under all normal flight attitudes and conditions.

Thus, it appears practicable to utilize the familiar turbojet engine as the power plant to carry fighter aircraft across the threshold of sonic speed and well into the supersonic regime, at least to Mach number 2.0.

When these speeds have been attained in piloted flight, the straight ramjet engine is available to carry the plane economically up to Mach numbers 4.5-5.0, at which point the rocket motor is available.

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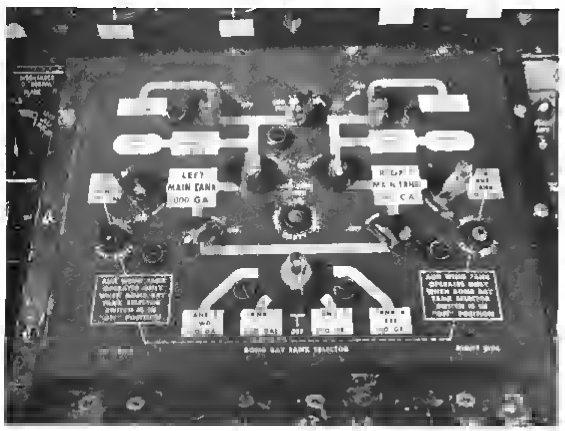
3. Cleveland Laboratory Staff: Performance and Ranges of Application of Various Types of Aircraft Propulsion System. NACA TN 1349.



Flow Panel Eases Tank Selection

Engineers of the Glenn L. Martin Co. have devised a "pictorial" cockpit panel to eliminate confusion in selection and control of flow in the complex fuel system of the new P4M Mercator.

A land-based Navy patrol plane, the craft is fitted with a Pratt and Whitney R-4360-20 Wasp Major and an Allison J33-A-23 turbojet in each of two nacelles. The control panel traces, via an illuminated path, the route traveled by the fuel from any of eight tanks to any of the four engines, affording an instant picture of flow conditions.

Located forward of the control quadrant for convenience of either pilot, the panel is 13 × 10 in. and is made of transparent acrylate plastic, covered with a vinyl plastic decal depicting fuel tanks and engines in white, with a contrasting color for fuel lines.

Ten small plastic control knobs are located on the panel in positions corresponding to the location of the valves they control in the actual fuel system. These knobs are so designed that the illuminated fuel flow line is visible when the knob is in the "on" position and hidden from view by an opaque extension when the knob is in the "off" position.

In the accompanying photo, the panel shows that the four bomb bay tanks and the left and right auxiliary tanks are shut off. By following unbroken light paths, pilot can tell that left main tank is feeding the two left engines, right main tank the two right engines. Crossfeed is shut off.

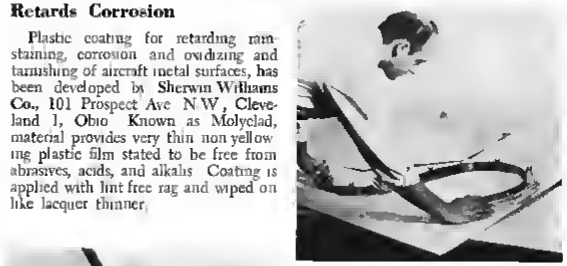
Terminal Block

To expedite test procedures and electrical hookups, terminal block known as "Crablok," provides for many connections and permits rapid disconnection as well as positive locking of terminal leads. Made by Burndy Engineering Co., Bruckner Boulevard, New York City 54, device is furnished in several lengths, and in either single or double-tier types. Individual strips are placed end-to-end to provide required connections. Unit is molded of phenolic plastic with reinforced barriers between channels. Spring-loaded socket connectors are available in two sizes for conductors ranging from #20-#8 AWG. Insulating cover snaps on terminal block, providing identification area. For normal quick-disconnect, contact tip is inserted into spring-loaded connector. Positive locking of connection is via screwdriver.

NEW AVIATION PRODUCTS

Retards Corrosion

Plastic coating for retarding rain-staining, corrosion and oxidizing and tarnishing of aircraft metal surfaces, has been developed by **Sherwin-Williams Co.**, 101 Prospect Ave. N.W., Cleveland 1, Ohio. Known as Molyclad, material provides very thin non-yellowing plastic film stated to be free from abrasives, acids, and alkalis. Coating is applied with lint-free rag and wiped on like lacquer thinner.

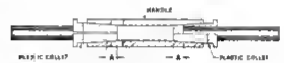


Template Gives Many Forms

Flexible template which may be set and locked to desired shape and transferred to other location to facilitate construction, repair or checking is distributed by **Clark & Poggenburg**, 4900 Wynnefield Ave., Phila., Pa. Device duplicates curves, cutting time of plotting, drawing, or template making, and eliminates trial-and-error fitting in fabrication of curved parts. Lengths, beginning with 2 ft., are available in 1-ft. increments.

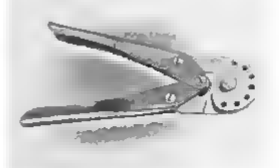
Labels Parts

Improved E-Z Code identification markers, self-adhesive strips, used for coding of pipes, conduits and cables, are now provided individually mounted on speed tab. Maker is **Western Lithograph Co.**, 600 E. Second St., Los Angeles 54, Calif. When tab is broken at perforation, marker is freed from smaller segment of card and applied to pipe without moistening. Markers are claimed to be unaffected by temperature or humidity and are printed with fade-proof inks on 1½ × 9-in. tape.



Colored Plug Gage

Lightweight plastic is used in collet-held plug gage made by **Turner Brothers, Inc.**, 2625 Hilton Rd., Ferndale 20, Mich. Go and no-go gage members are held in opposite ends of handle by self-locking plastic collets. Collets are made with solid base (A) which acts to stop gage member and prevent it from slipping through collet into handle. To increase speed of handling, collets are black and red, respectively, to signify go and no-go.



Cuts Rivets

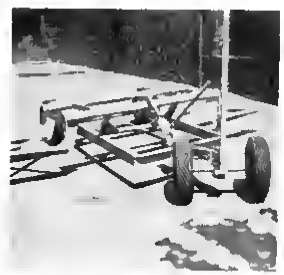
Handy item for aircraft mechanic's tool kit is hardened steel cutter for rivets of standard diameter from ⅛ to ⅜ in. inclusive. Without burring, it cuts ⅛-in. rivets one at a time, other three sizes, two at a time. Unit weighs 12 oz. Distributor is **Air Associates, Inc.**, Teterboro, N. J.

New Rubber Compound

Flexible synthetic rubber, Thiokol FR-1, resistant to gasoline, oil, paint and many chemical solvents, is offered by **Thiokol Corp.**, Los Angeles, Calif., for airplane fuel system and paint spray equipment parts. Reported to stay flexible over wide temperature range, it is pliable at −45 F without a softener. Rubber does not melt at high temperatures, although it is recommended that it not be used above 212 F for long periods. Product is supplied in raw form for processing and vulcanizing like natural rubber.

For Nickel Plating Jobs

Tarnish- and corrosion-resistant finish is offered via Lustralloy, plating material announced by **Lustralloy Sales Corp.**, 10 East 52nd St., New York City, stated as applicable to any base metal, without use of electricity. Claimed is that uniform thickness on all contours and recesses is obtained, and that heat treatment enables high hardening with unusual ductility. Wear resistance is represented as comparable to most hard chromium plate.



Eases Seaplane Handling

Hydraulic dolly, for simplifying task of transferring seaplanes from fixed or movable ramp to hangar or positioning craft in hangar or on apron, is announced by **Marianno Seaplane Ramp Co.**, 30 Church St., New York City 7. Operator tilts craft up about ½ in., to position dolly platforms under float keels. Platforms can be raised, via hydraulic hand pump, to 10 in. height from initial ½ in. position. Fabricated of steel, device weighs 75 lb., will support craft up to 2000 lb., and can be towed by man or truck.

Aircraft Gate Valve

Designed to afford greater accessibility for easier and faster servicing, motor-operated gate valve is announced by **Hydro-Aire, Inc.**, Burbank, Calif. Seals are removable without disassembly of entire valve, and electrical section, containing motor, limit switches, receptacle and wiring, is replaceable with removal of five screws. Operation is at normal voltage of from 18 to 30v. Unit is adaptable for use with ambient temperatures up to 550 F. It's stated that unit is unaffected by dust, humidity or water, is explosion-proof, and has provision for indicating light.

British Policy Criticized by Labor

Aircraft workers' meeting reflects growing sentiment for nationalization; resolutions say "Fly British."

LONDON—First evidence of industry wide labor sentiment for nationalization of British aircraft building was a meeting at Manchester last week of 40 delegates elected by shop steward committees and representing nearly 100,000 workmen in 16 major aircraft plants and three nationalized airlines.

At no time, however, was there expectation that the temper of the group would lead at the close of the four-hour talks to a final resolution urging nationalization as an ultimate objective.

▶**Closer Objective**—Probably closer is a more modest objective such as concentration of the entire industry on production of a single type plane for each purpose (as in wartime) rather than competing types.

This appears to approximate the consensus of the labor force, which is more concerned with preserving its jobs and smokes than ambitious nationalization schemes. With a steel nationalization fight imminent, the Labor Party is unlikely to tackle this additional touchy issue.

▶**Government Criticized**—Nevertheless the meeting's resolutions criticized the government's concessions in allowing purchases of foreign aircraft—for example Canadians Constellations and Stratocruisers—and called on the Prime Minister to establish a planning committee comprising workers, union officials, employers and the ministries to implement a firm "Fly British" policy.

Employers regard the present state subsidized development programs and single purchaser arrangements as mainly satisfactory, but a maximum limit to socialization. Considerable feeling exists that any further encroachment would justify employers in abdicating direction and salvaging what capital they could, rather than cooperate.

▶**Protest Outgrowth**—The Manchester meeting was the outgrowth of an A. V. Roe & Co. delegation's protests against the Tudor scrapping several weeks back. There were reliable assurances that no communist inspiration nor other outside motivation was behind it.

Chairman Leonard Waywell, chief shop steward at Avro, has held his job continuously for the past six years and enjoys the confidence of his fellow workers as a result of consistently getting things done in their behalf. A milling machine operator, he is 35 and married.

S. African Nonskeds Strike Policy Snag

JOHANNESBURG — The United Kingdom does not seem to be big enough to contain the Labor Party government's nationalizing policies, especially its air policies.

Private nonscheduled air operators in the Commonwealth, South Africa in particular, also are affected by Britain's air laws, and fuel can be and has been refused to them if they are not the chosen instruments to operate with the three British state-owned air lines. In South Africa, South African Airways is the chosen instrument.

▶**Two Affected**—Mercury Airways and Sudair International Airways, two private airline operators, recently have been affected by the United Kingdom's decision to refuse facilities at U. K. airports to all aircraft on commercial flights unless they have been authorized by the Ministry of Civil Aviation.

In effect, this bans non-scheduled operators in favor of the British Overseas Airways Corporation and South African Airways. Mercury Airways Skyliners have landed in the United Kingdom despite the ban, but they have been refused fuel.

▶**Ban Avoided**—Both companies, however, have got around the United Kingdom's ban by flying their passengers to Paris. Sudair's passengers are flown to the United Kingdom in a British charter company's aircraft from Paris, and Mercury flies its passengers free from Paris to London, and vice versa.

The British Government's attitude to private nonscheduled airlines has spread to the British African territories and may result in the commercial operators' abandoning the all British East and Central African air routes from South Africa to the United Kingdom in favor of the all-foreign West Coast route.

▶**Territorial Restrictions**—Gordon Fillery, chairman of Mercury Airways, considers that along the present routes deliberate attempts are being made by many territories to restrict the operations of South African Commercial airlines so that only State-owned or State controlled aircraft are able to fly.

Southern Rhodesia, Northern Rhodesia, Kenya, Tanganyika, Sudan and Cyprus have all taken action against private enterprise, he says, and his company has received more official support from foreign countries than Britain and the British colonies. The French government gave permission for flights into France. The Greek government recognized Mercury Airways as a scheduled airline operating from Greece to African territories and arranged for the carriage of mails.

TAXIING TESTS FOR THE SAAB-29

Sweden's Saab-29, bearing a vague resemblance to the Grumman F9F, is undergoing taxiing tests and should be ready for initial test flight in September. The Swept-back wing pressurized, jet fighter, is powered by a de Havilland Ghost (Aviation Week, July 12). Possibly bent on cracking the sonic barrier, the manufacturer claims the wing "has been designed in arrow form to allow flying at speeds approaching that of sound."

Bank Credits Still Aid Airlines

Despite slump in earnings, carriers continue to get new loans plus advances against stand-by credits.

Bank credit continues to play a very important part in financing airline operations. Despite the poor earnings performance of the industry as a whole, additional bank loans are being advanced to a number of air carriers. For the most part, however, current advances are being made against stand-by credit arrangements entered into in 1945 or 1946 when the airline industry's fortunes were in relatively good standing.

▶**Pattern**—Most bank loans follow a uniform pattern. They start out as a stand-by credit arrangement for an initial period of a year or two with a provision that they become funded (i.e., fixed) and subsequently payable at periodic intervals, usually over a four-year span. In this manner, short-term bank credits are converted into loans.

Pan American Airways' recent action in drawing down its full bank credit is indicative of the general industry practice. This carrier has converted its $40 million stand-by bank credit into a four-year term loan as provided in the credit agreement of October, 1946, with a group of banks headed by the National City Bank, Guaranty Trust Co. and Chase National Bank, all of New York. The loan is now payable in eight equal installments of $5 million each every six months, and carries a 1¾ percent interest rate.

▶**Benefit**—Pan American previously had drawn down only $24 million of this credit, but in order to have the benefit of the entire credit limit, it drew down the balance and converted the full loan as of July 1, 1948. Not to have done so would have precluded the company's obtaining the benefit of this current bank credit at a later date. Should the carrier subsequently discover it needed additional banking accommodations, it is probable that such credit would prove more difficult to obtain and certainly it would come at a higher interest cost.

Pan American does not need the full $40 million and has reinvested $16 million of the loan in government securities, cutting the carrying charge on that amount to about ¾ of 1 percent. The loan is principally to cover the cost of the new Boeing Stratocruisers and Convairs. Pan American has reported cash and government securities at the present time as nearly approaching the $40 million term loan.

▶**Interesting Credit**—Probably the most interesting bank credit outstanding is the one extended to Eastern Air Lines. This carrier, under date of Dec. 31, 1946, negotiated a revolving credit and term loan agreement for $20 million with 27 banks headed by the Chase National Bank. This credit, when drawn, carries an interest rate of 1½ percent annually. A stand-by interest charge of ¾ percent on the unused loan commitments is also paid.

Eastern has drawn only $5 million of this credit. Ironically, the carrier is not in need of this advance, and a proper offset may be found in its investment in a like amount of General Motors Acceptance Corp. short-term paper. Including the existing bank advance, Eastern's net working capital currently is estimated at more than $8.5 million. Originally, the bank credit arrangement was entered into to facilitate the financing of new equipment. Thus far, Eastern has made more than $18 million in capital expenditures for a fleet of 14 Constellations. For all practical purposes, it financed such acquisitions from current funds.

▶**No Need**—It is probable that on or before Dec. 31, 1948, Eastern will draw down the balance of its bank credit to the full limit of $20 million. The carrier is in no need of such funds, but under the terms of the agreement, it will find the transaction highly desirable. Upon being funded, the entire loan will be payable over a three-year period in equal quarterly payments from the effective date of the loan, Jan. 2, 1949. The interest rate on these notes will be only 1¾ percent. The company easily can use these funds to buy an equal amount of high-grade short-term securities returning a yield approximating its interest cost on the notes. In this manner, Eastern will have the benefit of a bank credit arrangement with but a nominal if any, interest cost.

In January, 1947, United Air Lines, as part of its general financing program, arranged a $28 million revolving bank credit with a group of 35 banks headed by the National City Bank. This credit became a term loan effective July 1, 1948, payable in 20 equal quarterly installments starting Oct. 1, 1948. These notes carry a 2 percent interest.

▶**Maintain Balances**—Along with its bank loan, United also sold $12 million in 3¼ percent debentures to two insurance companies. These loans mature Feb. 1, 1967, but have strong sinking fund payment requirements which are designed to extinguish most of the principal before maturity.

It was largely because of the provisions made for the protection of the debentures and the bank loan that United recently found it necessary to do additional common stock financing. Funds thus made available provided an added margin of safety in maintaining stipulated working capital balances.

▶**General Program**—The same general bank credit pattern exists for Northwest Airlines. In April, 1947, this carrier obtained an $18 million revolving credit from a group of 14 banks headed by the Bankers Trust Co. This, too, was part of a general financing program which contributed more than $9 million through the issue of new preference stock.

It is believed that more than one-half of this credit has been drawn down thus far. The current credit carries a 2 percent interest rate, with a commitment fee of ¼ of 1 percent on the unused balance. Sometime on or before Apr. 30, 1949, the entire bank credit will be funded on a 2¾ percent interest basis payable in 20 equal quarterly installments.

▶**Higher Interest**—It is significant to note the progressive higher interest charges which have accompanied all of these loans. Generally, the earlier these credits were arranged, the better the terms obtained. Two factors were primarily responsible for this. As previously noted, airline credit was in relatively high repute and not anywhere nearly so impaired as at present. Further, the general level of interest rates was lower a few years ago than it is now.

Other airlines having similar bank credit and term loan arrangements include Braniff and Delta. Chicago and Southern, though having a $2 million loan from three banks, has a much lower credit standing and was therefore required to secure this advance by a chattel mortgage on its fleet of 16 airplanes. By contrast, despite a large issue of $40 million in unsecured debentures outstanding, American Airlines, on Feb. 2, 1948, was able to arrange a $7,500,000 line of bank credit without any serious restrictions. Thus far, none of this credit has been touched but was merely arranged as an "insurance policy" in case of unforeseen developments.

Without the use of bank credits extended, the present financial problems of the industry would be compounded.

—Selig Altschul

Used Airplane Business Is Slack

A thriving field after the war is now glutted with surplus planes and two-placers which public no longer wants.

By Stanley L. Colbert

A used airplane business, which sold 8000 airplanes during peak months, is now caught in a combination of 'surplus doldrums" and 'super-salesman blues."

In a representative section, the New England Middle Atlantic area, there are nearly 10,000 private aircraft owners, and over 800 of them want to sell their planes. Most of the craft have less than 150 hours.

▶**Upkeep Too High**—Powers and George, 475 Fifth Ave., N. Y., one of the largest used aircraft clearing houses, explains the situation this way. After the war, the government had huge stockpiles of aircraft, many of them training planes, which had to be sold quickly. Planes were advertised as originally costing up to $25,000 and now going for a song. Many people, ignorant of upkeep cost and maximum potential utilization, bought the planes. Now they want to get rid of them, at any price to any taker.

Powers and George explains "salesman blues" as being a compliment to the prowess of aviation salesmen who sold an eager public on aircraft which did not meet their present needs.

It didn't take the public long to realize that:

- Maintenance, hangar fees and upkeep costs are sky high.
- A plane needs more than a 65-hp powerplant.
- A plane needs a starter, lights and radio equipment.
- You don't have to learn to fly in a tandem plane.

The firm is convinced that the staple two place craft does not meet the requirements of the average private pilot.

TOP-NOTCH CESSNA SELLING TEAM

The top Cessna selling team is represented here as Frank Boettger, company secretary-treasurer, second from right, congratulates dealer-host R. E. Bowman during a recent northern California district sales meeting. Standing in front of the Cessna 190 which Boettger flew to Oakland from Cessna's Wichita, Kan., headquarters are, left to right, Don Flower, general sales manager; Frank Martin, regional sales manager; Bowman, Boettger, and Henry Von Berg, president of Pathfinder Flying Service, northern California Cessna distributor. Stockton Twenty-eight dealer representatives from Oregon to Fresno flew to the one-day meeting. The date was Friday the 13th.

▶**Glutted**—As a result, the airplane business is now glutted with war surplus and two-place craft, and the takers are few. Most of the planes have only 125-150 hours on them. Some, such as the Ercoupe, have as little as six hours and as much as 250 hours.

Of the 40-odd inquiries Powers and George receives each week from prospective purchasers, most of them who want two-place airplanes inquire about the Swift 125 and the Cessna 140. The four-place inquiries usually concern the Navion and Bonanza. Only one-quarter of the inquiries pan out into sales.

▶**Prices**—Powers and George claims it can sell a plane with 100 hours on it or less for one-third to one-half off the list price for a new aircraft. But prices on the Bonanza, Navion and Swift 125 are a little higher since the manufacturers have paced production, occasionally easing off, and sometimes, like Beech, building only on order. Cessna 140s, with 100 hours, are selling for $1900-$2000. Luscombes are selling for about $2700.

Contrary to popular belief, the brokers claim, there is no real demand for a metal plane over a fabric plane. Owners have found that the metal must be buffed constantly to keep it rust free, and that after a while, the cost of buffing is almost as much as the cost of a refabricating job. The only time that metal covering takes preference is when it is painted and advertised as "corrosion-proof."

▶**Summer Demand**—Most planes are offered for sale in the winter, when utilization is low. However, most planes are bought in the summer.

Almost 80 percent of the demand for used aircraft is for four-place craft.

Right now, Powers and George has found, the plane most aircraft owners want to sell is the Ercoupe. Some owners have found that a two-control plane is hard to handle in emergencies, others feel it does not have enough speed, many just want a four-place airplane.

Powers and George patterned its organization after the yacht business which it claims is similar to the aviation business in that it feels the airplane is basically used for sport. This is a point which the industry cannot entirely agree on, and such people as Walter Beech claim that "there can be no market for personal aircraft for pleasure purposes alone."

▶**Survey**—In fall, 1947, the firm sent out 6159 inquiries to private plane owners from Maine to Virginia asking whether their aircraft were available for sale. At that time, 338, or .054 percent, answered yes. Early in 1948, the same notice was sent to 7070 owners and the percentage answering the affirmative was only slightly higher.

As long as prices on new aircraft are $5000 and above, Powers and George feels that the used business will outsell the new business. It is convinced that the flying public wants a four-place plane with starter, lights, radio equipment and other extras at a price below the cost of today's airplanes. It seems to feel that the only place the public can find this is in a used airplane.

Airplanes or Groceries: Customer's Choice

It's a toss-up whether customers at 48-03 Ditmars Blvd., Astoria, N. Y., want aircraft equipment or butter and eggs. The front part of the building is a conventional grocery store. The rear is partitioned into an office where Walter K. Jaros Aircrafters conducts a supply business—so thriving that the firm may soon be forced to get a building of its own and come out into the open.

No small outfit, Jaros recently has been appointed distributor for Allen Mfg. Co., Flexloc, and Palnuts Corp., bringing his total number of distributorships to 17. His accounts include most of the major airlines and maintenance firms in the New York-New Jersey area.

For the present the firm, which handles instruments, rivets, bolts, fabrics, tapes, engines, propellers and aircraft, is having to devise novel methods for storing and stocking its huge supplies of equipment.

▶**Large Stocks**—The basement of a nearby house serves as one storeroom. Here, Jaros keeps what he claims is one of the largest stocks of the Elastic Stop Nut line. The Jaros home also holds equipment, and there have been hints that empty space in the grocery store also is being utilized.

Lately, Jaros has been specializing in DC-4 modification kits supplying them to companies making the CAB-ordered revisions in the craft.

He also has added a stainless steel exhaust manifold kit and collector ring kit to his large line.

Aerocar Road Test Scheduled for Fall

Moulton B. Taylor, Longview, Wash., designer of the new experimental Aerocar, hopes to have the automobile portion of his air-land vehicle on the road for test runs this fall.

Car component will be completed before construction is started on the detachable wing-tail section. Designed to carry two in the air and three on the ground, the Aerocar will be powered by Franklin 100-115 hp. engine and is expected to cruise at more than 100 mph. with a 53-mph. landing speed with flaps. Gross flying weight is 1640 lb.

▶**Design**—Taylor reports that the design includes built-in safety structure, engine mufflers, quiet propeller located behind tail group, spiral stability derived from a bottom fin, roominess, front wheel car drive with castering rear wheels for crosswind landings, four-wheel hydraulic brakes, fuel injection and positive directional stability at high angles of attack.

Tentative price for the Aerocar has been set in the $3000 to $4000 range.

$800,000 for Fort Worth

Despite objection by the city of Dallas, Fort Worth Midway Airport has been listed for a Federal grant of $800,000 in the 1949 Federal Airport Program.

Two examiners who conducted special hearings for CAA on the objections found no evidence to indicate the original recommendations made by CAA regional personnel should be reversed.

Woman's Place

Figuring that the woman of the house is the main reason the man of the house isn't flying, the Iowa Aeronautics Commission intends to do something about it.

First step in a campaign conducted by Norbert Locke, director of the Iowa commission, is an open letter to women in the current issue of the commission's Aviation Bulletin, a monthly publication distributed to aviation enthusiasts in the state.

'The open letter begins by telling the housewife that she is probably ironing and thinking to herself, "I wonder why he thinks so much of that damned airplane and I wonder what particular fun he gets out of getting up early in the morning and flying someplace to breakfast, or what can be interesting about just hanging around the airport all day Sunday."

Locke's letter continues, conjecturing, "... I'll bet that secretly you would like to attend some of these flight breakfasts or hang around the airport yourself ..."

The letter asks, "Why don't you surprise the old boy by climbing into those slacks and telling him you are going to be 'up in the air' Sunday, too."

It concludes, "I hope you will at least give the airplane a fair chance to prove itself to you ..."

Bonneville Hires Aerial Patrol

Central Helicopters, Inc., Portland, Oregon, has received a contract from the Bonneville Power Administration to patrol Bonneville's 3000 miles of transmission lines. The contract, awarded on a low bid of $30,250 for 5500 hours, calls for furnishing machine, maintenance, fuel and oil and pilot.

The entire Bonneville system will be covered. An experimental three-month patrol by helicopter in the spring of 1947 was said to have been so successful it resulted in the present contract. Leland F. Murray, BPA superintendent of maintenance, said the helicopter "enabled our men to see more things faster." The system can be covered in 50 hours of flying and the two men aloft accomplish the work of 36 men on foot.

Airstrip Use Increases

Cleveland's still incomplete lakefront airstrip has shown steady increase in small plane traffic since last January, reaching a new high in July with 1563 arrivals and departures. Only a small number of planes using the strip are based in the greater Cleveland area, most of them come from other Ohio cities or from outside the state.

In the first week of July arrivals and departures were logged for 34 planes from other places in Ohio and for 24 out of state planes. Convenience of the downtown lakefront airstrip, and of similar strips at Chicago and Milwaukee, is expected to give these cities commercial advantage over other midwestern cities as personal aircraft use expands.

Illinois Airport Directory and Chart

Illinois Department of Aeronautics has distributed a multi-colored aeronautical chart and airport directory to every registered pilot in the state.

In addition to regular map data, the directory also contains listings of commercial broadcast stations in the state, illustrated visual light gun signals, hand taxi signals, explanation of teletype symbol weather reports, location of weather stations, airmarking directions, local and national Civil Air Regulations and international Morse code.

▶**Landing Tips**—The airport directory has the following information about each of Illinois' airports: food facilities; proximity of railroads, shopping, transportation, lights, hotel facilities and conditions at the fields which might require extreme caution in landing.

The Department of Aeronautics plans to revise and reissue the map and directory every six months.

Washington State Issues Flight Map

A four-color flight map which divides the state into three sections, with one page for each section, is being distributed by the Washington State Aeronautics Commission to airport operators, fixed base operators and private flyers.

▶**Airport Information**—The map follows topography of the state in its divisions, with one strip for the west side, where most of the flights are north-south; another for the mountainous section that divides the state and the third for the flat east side. The strips overlap to the extent of 50 to 100 miles.

Airports in each section are listed along the strip wherein they lie, with information covering the elevation, length and type of runways, gasoline octane content, and such facilities as meals, phone, transportation, etc. Five skyways are shown on the map.

The folder also includes information on airfield taxi signals, airport traffic lights, ground-air emergency code, weather information centers, and air search and rescue procedure.

Aircraft Patrols Used To Halt Illegal Fishing

Massachusetts Aeronautics Commission experiments with flights off the coast have contributed so greatly to the decrease of offshore illegal bass seining operations that the flights will be continued in the future.

Using the state's Stinson Voyager, aeronautics inspector M. Murray Carney and Howard Willard, chief coast warden, have already trapped several illegal seiners, radioing locations of the fishing vessels to patrol boats and patrol cars.

Warden Willard, who worked out the aerial plans with his superior, Francis W. Sergent, said: "The use of the airplane has been directly responsible for 50 percent of our success and a tremendous drop in illegal fishing off the Massachusetts coast."

$2,000,000 Fire

Fire of an unknown source destroyed a large part of Solberg-Hunterdon Airport, Flemington, N. J., with damage estimated at $2,000,000.

Large stocks of surplus plane parts were destroyed by the blaze which started on the north side of a cluster of buildings at the field.

Flames gutted a warehouse, large garage, several small hangars and some aircraft. A combination restaurant and dormitory, used during the war for a flying school was saved. Planes on the apron were hauled to safety. Operator of the field is Thor Solberg, pioneer trans-Atlantic flier.

BRIEFING FOR DEALERS & DISTRIBUTORS

SPRATT WING FLYING BOAT — George Spratt, persistent researcher into the problem of direct flight control, last week made the first flight with the latest of his controllable-wing flying boats near his small plant at Deep River, Conn.

Formerly associated with Stout research division of Consolidated Vultee, Spratt developed an experimental controllable-wing roadable plane which was flown many times but was never put into quantity production. Previous to that, he developed and flew several earlier controllable wing landplanes and flying boats. Last week in his first test flight (of a mile and a half) Spratt reported his flying boat performed "entirely up to specifications." Additional test flights will follow.

CAA DEVELOPMENT GHOST WALKS—CAA might still do something about improving personal airplanes with development contracts if funds could be made available and the manufacturers would consent to the development program.

The subject of CAA personal plane development was resurrected last week by Aircraft Owners & Pilots Association, largest personal aircraft consumer organization with some 40,000 members. This time the spokesman was not J. B. Hartranft, Jr., general manager, who already has done his share of sticking his neck out on behalf of the pilot, but his new assistant general manager and editorial director, outspoken Max Karant, former editor of Flying magazine.

Karant has flown most of the contemporary personal planes. In a blunt four page reply to a letter from Joseph T. Geuting, Jr., Personal Aircraft Council manager, Karant invited the manufacturers to look at the record of industry personal airplane developments as compared to government sponsored developments.

Digging into his back files, Karant started with the Stearman Hammond Y and the Weick W-1, predecessor to the Ercoupe, and brought his case history up to the present, citing en route all government-sponsored developments.

Karant chalks up "only one" comparably worthwhile development, the Cessna spring steel landing gear, on the manufacturer's side.

Geuting had written that the Personal Aircraft Council was "unalterably opposed to the CAA's having anything to do with development of personal aircraft. They are not a user service and inevitably out of any developmental activities they would supervise would come ideas which are impractical for the manufacturers to work with and undoubtedly further regulatory problems would result."

He stated that PAC has no objection to there being a development program sponsored by the government which could be carried on through NACA and the military services.

Karant inquired: "Does the record show that CAA has saddled the aviation industry with new regulations because of a CAA-sponsored development?"

Asked by AVIATION WEEK whether CAA would still be interested in letting development contracts to industry for improving the personal plane, Administrator Del Rentzel said last week that he saw little use in pushing such a program against manufacturers' wishes. He would, however, like to have CAA undertake such developments if the manufacturers would support the program.

ATS MEMBERSHIP RULES—Look for a change soon in membership rules of the Aeronautical Training Society which will open membership to several large fixed base operators who have been seeking admission.

Capt. Max Balfour, director of Spartan School of Aeronautics, Tulsa and ATS president held an exploratory meeting in Washington recently on the proposed change in the certificate of incorporation. Meeting with him were such ATS mainstays as Merritt Anderson, Milwaukee; Clarence Page, Oklahoma City; and John McCabe, Miami. Proposed changes will be discussed further at a Cleveland meeting Sept. 5.

Heretofore ATS membership has been restricted to the original flight schools, which gave most of the World War II Air Force pilots their primary instruction. Under another change in membership requirements, each corporation will have a single membership, regardless of how many branches or schools it operates.

—ALEXANDER McSURELY

How Large Are "Large Irregulars"

AVIATION WEEK survey of transcontinental nonskeds shows they are a long way from being big business.

Big business still has not found a foothold among the inappropriately named "large irregular carriers" whose activities are currently being investigated by the Civil Aeronautics Board.

Even the transcontinental nonskeds which grew impressively this spring and summer do not compare with the smallest certificated trunklines, an AVIATION WEEK survey has disclosed. Under CAB's definition, a nonsked becomes a large irregular carrier when it has a single aircraft having an allowable gross takeoff weight in excess of 10,000 lb. or several planes with an allowable gross takeoff weight between 6000 and 10,000 lb. and an aggregate gross takeoff weight in excess of 25,000 lb.

▶**Transcontinental Trio**—During the first half of 1948, three cutrate irregular carriers—Standard Air Lines, Long Beach, Calif.; Airline Transport Carriers, Burbank, Calif.; and Viking Air Lines, Burbank, probably accounted for between 50 and 70 percent of New York-California nonsked traffic. Yet their total personnel last spring numbered about 221—less than half the employment reported by Colonial Airlines.

Inland Air Lines, smallest of the 16 certificated domestic trunklines, flew 34,148 revenue passengers 12,478,000 revenue passenger miles in the first six months of 1948. By comparison, Viking flew 7020 passengers 11,903,328 revenue passenger miles; Standard flew 5895 passengers 10,415,714 passenger miles; and Airline Transport Carriers flew 2180 passengers 4,295,679 revenue passenger miles.

The 26,614,721 revenue passenger miles flown by the three largest transcontinental nonskeds in the first half of 1948 contrasted with 572,644,000 for American Airlines, 516,795,000 for United Air Lines and 410,672,000 for TWA's domestic operations.

▶**Revenues Listed**—Including contract as well as nonscheduled operations Airline Transport Carriers reported a $37,637 profit during first half 1948 on gross revenues totaling $262,236. In the same six month period, Standard had a $12,709 operating profit and $39,277 net profit on $526,677 in gross revenues; Viking reported $118,999 operating profit and $76,482 net profit on $274,238 gross income during the first quarter of the current year 1948.

Assuming that Standard, Viking and ATC accounted for only 50 percent of the New York-California business handled by nonskeds during the first half of this year, gross revenues of all irregular operators on the run would total somewhat over $5,000,000 on an annual basis. To this can be added a comparatively small volume of business done by independents operating between the Pacific Northwest and New York. The $5,000,000 to $6,000,000 annual business compares with the $10,000,000 figure used by the certificated carriers in requesting a CAB crackdown on the transcontinental nonskeds.

▶**Records Incomplete**—The Civil Aeronautics Board, which is considering revision of the nonscheduled exemption, is still encountering difficulty in getting an overall picture of the irregular operators. Farth thus month, the Board froze at 109 the number of irregular air carriers authorized to use large-type transports. At the same time, CAB found that only about 35 had submitted required financial and traffic reports covering the first quarter of 1948, and some of these were far from complete.

Among 28 carriers submitting fairly complete reports, there were 61 planes, of which 46 were DC-3s and eight were DC-4s. The 28 companies had 600 employes, assets totaling around $4,340,000, and gross revenues aggregating about $2,200,000 during the first quarter of 1948. More than half of the carriers reported a reasonable profit for the period.

Meanwhile, the Air Transport Association has made a survey of overseas nonscheduled and contract operations. It said that while complete information is still unavailable there is no doubt that the independents have diverted considerable business from the certificated lines, especially on the New York-San Juan and Pacific Northwest-Alaska routes.

TWA Deficit

Showing sizable losses on both its domestic and its international operations despite increased traffic, TWA completed the first half of 1948 with a $4,380,540 net deficit. Net loss in the same period last year was $5,314,243.

Domestically, TWA reported a $1,210,680 operating deficit and a $1,682,572 net loss during the first half of 1948. Operating loss on the carrier's international routes was $2,484,105 and net loss was $2,697,967.

C&S MANAGEMENT CHANGES

Carleton Putnam (right), who founded Chicago & Southern Air Lines in 1933, has resigned as president, a position he has held for the past 15 years. His successor is Sidney A. Stewart (left), formerly executive vice president. Before joining C&S in 1946 Stewart was a vice president of United Aircraft Corp., serving as general manager of its Hamilton Standard Propellers division. Putnam will remain with Chicago & Southern as chairman of the board and voting trustee. His work will center on public and government relations, new routes and rates, stockholder relations and financial policy. Putnam plans to move his headquarters to Washington this fall.

Mail Parade

EAL lines up with AA, UAL, TWA, NWA, in higher rate plea.

Eastern Air Lines has joined American Airlines, United Air Lines, TWA and Northwest Airlines in stamping its new mail rates as unrealistic and likely to result in future losses.

CAB's "big five" mail rate decision of last April set EAL's pay at 68.38 cents a ton mile—equal to $2,604,000 in a future year. Eastern says it will actually need a minimum of $12,765,000 in mail pay during 1948 to earn a 10 percent profit after taxes. The carrier added that it does not consider a 10 percent return reasonably adequate compensation for an enterprise subject to as many economic hazards as the air transportation industry.

▶**Loss Predicted**—CAB forecast that Eastern would show a $12,572,000 profit before mail pay during a future year at the new rates. Declaring that the Board had overestimated revenues and underestimated expenses and required investment, EAL president E. V. Rickenbacker countered that the new mail rate actually would result in a $4,595,000 loss before mail pay in 1948.

Moreover, Eastern continued, there is likely to be a decrease in revenues and higher expenses during 1949 and subsequent years, causing even larger deficits. Rickenbacker declared that EAL's high traffic level and favorable earnings during the first half of 1948 could be traced in large measure to its competitors' temporary difficulties—the National Airlines strike and the DC-6 grounding which affected both NAL's and American's operations.

▶**Reserve for Strikes**—Eastern reported $1,321,065 system wide net profit in the first half of 1948, against $1,318,117 in the same 1947 period. It is the only domestic trunkline to show substantial earnings both last year and during the first six months of 1948.

Rickenbacker said that CAB should allow EAL $2,000,000 annually as a reserve for losses due to strikes and groundings. He asserted that the current mail rate makes no such provision and forces carrier to bear full risk.

Stating that the Post Office made a profit of over $10,000,000 on Eastern's airmail services between 1943 and 1947, Rickenbacker called on CAB to increase company mail pay by at least $4,603,000 for the period July 8, 1947, to Dec. 31, 1947. EAL said it lost around $500,000 after mail pay during the period at the former 45 cents-a-ton-mile rate. For all of 1947, Eastern's domestic operating profit was $2,859,703, highest in the industry.

EAL Buys Five More New-Type Connies

Eastern Air Lines has shelved its plans to purchase 20 new twin-engine transports and instead has ordered five more new-type Constellations.

Capt. E. V. Rickenbacker, EAL president and general manager, indicated this decision was made after careful investigation and tests with Convair-Liner and Martin 2-0-2 equipment. The 20 twin-engine planes would have cost $10,000,000, while the five additional L-649 Constellations will cost the airline approximately $6,250,000.

▶**Fall Delivery**—Eastern will have 20 Constellations when the five new craft are delivered in the fall of 1949. The carrier now has 13 L-649 Constellations, and two more of the craft are to be delivered to the carrier next February (AVIATION WEEK, May 3).

Rickenbacker declared that the superior performance of the new-type Constellation on both long-range nonstop flights and "practically local schedules" promotes economical operation and flexibility of utilization. Besides the Constellations, Eastern has 18 DC-4s and 51 DC-3s.

Airlines Still Row With Port Authority

Nine scheduled airlines, in a letter to New York's Mayor William O'Dwyer, have charged the Port of New York Authority with repudiation of leases, arbitrary actions and harassments, and they claim that such actions are driving airline business and employment out of the New York City area.

This is the second time the carriers have appealed to the Mayor. He turned the letter over to Commissioner of Commerce Edward C. Maguire for investigation and report.

Main cause of contention, as before, are leases with the Port Authority for New York International Airport, originally declared to be valid, and later, according to the airlines, repudiated by the Port Authority. But this time, the carriers had three new complaints:

- An arbitrary order by the Port Authority to close a roadway at LaGuardia, making it no longer possible to carry fuel to planes. Airlines claim this will cause some airlines to stop operations until other arrangements are made.
- Installation of pay machines at toilet facilities used by employes of companies at the international and domestic terminals at LaGuardia.
- Port Authority percentage fee, demanded on Air Force contract work proposed by American Airlines in order to avoid layoff of some maintenance employes. American had proposed to do the work at cost, plus $1. High fee to the Authority "places the company in a poor competitive position in bidding against companies in other localities where no similar charge is exacted."

The letter was signed by C. R. Smith, American Airlines; Harold Harris, AOA; J. H. Carmichael, Capital Airlines; Sigmund Janas, Colonial Airlines; Eddie Rickenbacker, Eastern Air Lines; Croil Hunter, Northwest Airlines; Juan Trippe, Pan American World Airlines; Warren Lee Pierson, Trans World Airways and W. A. Patterson, United Air Lines.

PROTECTION FOR PERISHABLES

Slick Airways has purchased four large mobile air conditioning units to supplement its permanent terminal facilities in providing complete protection for perishable freight in transit. The 26-ft. insulated Frenhauf trailers, with automatic cooling-heating units, have been placed in service at New York-Newark, Philadelphia, Chicago and St. Louis. Protected in the air by cooling and heating systems in Slick's C-46s, perishable items such as flowers, produce, seafood and certain drugs will be properly preserved on the ground while awaiting loading on planes, delivery to consignee, or transfer to other carriers. One of Slick's new air-conditioned trailers is shown above.

Transocean's Oakland shop is busy on outside contracts that help pay for its maintenance.

Transocean Makes Money

With a foreign charter service, an overhaul business, other activities, company nets half million in two years.

By Robert Hotz

OAKLAND, Calif.—Transocean Air Lines has found there is profit in the foreign air charter business.

During its first two years of operations Transocean has netted well over a half million dollars profit and acquired a fleet of 11 DC-4s, a flying school, its own major overhaul center and a string of operational bases around the world.

▶**Flying Executives**—Transocean credits most of its success to the fact that all its top executive personnel come straight from flight operations. Organizer and sparkplug of the outfit is tall, sandy-haired Orvis Nelson, for 12 years a United Air Lines pilot and trans-Pacific civilian pilot for the Air Transport Command during the war. Executive vice president is Ray T. Elsmore, veteran pilot with the National Parks Service and Western Air Express and director of all wartime air transport operations in the Southwest Pacific.

Transocean's five directors have a combined total of 75,000 hours of airline flying time.

▶**Organized in Tent**—Transocean was organized in the summer of 1945 in a candle-lit tent on Okinawa while a group of former United Air Lines pilots sweated out a typhoon, preparatory to flying U. S. occupation troops to Japan. This group, headed by Nelson, felt there would be a big opportunity for trans-Pacific airlift after the war providing the type of services the scheduled air lines were unable to handle. These pilots decided to risk their savings in an attempt to test their theory. They continued flying under Army contract until the summer of 1946 accumulating capital for their independent venture.

Original capital was $150,000 subscribed by 75 people who were among Transocean's first employes. Stock is now held by about 650 people, 80 percent employed within the company. Initial investment has mushroomed into assets valued at $4,000,000.

▶**Employes Chip In**—All of Transocean's financing has been through short term bank credits. No additional stock was issued after the original offering. Recently when Transocean needed an additional $75,000 working capital to get an Air Force overhaul contract operation underway it found local bankers terms unattractive. Within 24 hours airline employes had chipped in $93,000 in cash to swing the deal.

Backbone of Transocean's business has been its foreign charters. It began business with a single war surplus C-54 operating a contract to move U. S. Army dependents to Tokyo and now has one of the largest personnel movement contracts in history—flying 30,000 displaced persons from Germany to Venezuela for the International Relief Organization. The IRO contract will keep Transocean busy for two years and necessitated setting up a new chain of bases through the Caribbean.

▶**Charter Plums**—Transocean's charter business has been dependent on a sharp outlook for new business in which all company employes participate. Typical was one of Transocean's largest contracts—a job to haul 7,000 immigrants from England to Canada. A Transocean navigator on a freight haul to Europe picked up some scuttlebutt on a ship shortage halting immigration to Canada. Fast action on the tip by Transocean's sales staff located the key Canadian personnel involved and signed the contract before competitors smelled the business. Transocean has hauled 2000 cannery workers to and from Alaska for the salmon season, carries Navy civilian construction crews to Guam, Wake and Midway Islands, flew United Nation's truce team personnel to Rhodes and Palestine, has operated its planes on lease to TWA to handle a seasonal traffic rush to Europe, and flew engines to Europe bolstering the Berlin airlift.

Another moneymaker for Transocean has been its contracts to set up foreign air lines. First deal was with Philippine Air Lines and another with an Indian air line is brewing. Transocean set up PAL, training its crews, modifying its C-54s and making all survey flights and flying the routes until PAL crews were trained to take over.

▶**Overhaul Business**—As a result of the PAL contract, Transocean got into the overhaul business and bought Matson Navigation Co.'s overhaul facilities at Oakland Municipal Airport when Matson got out of the aviation business. Contracts to overhaul and ferry 150 C-46s to China for the Chinese Air Force; do major overhaul on MATS C-54s, and modify additional war surplus C-54s for foreign airlines has helped the maintenance division pay.

▶**Flying School**—When it became necessary to set up a flying school to train PAL and Transocean's own flight personnel it was expanded into the Taloa Academy of Aeronautics under direction of Roger Q. Williams and now offers a large variety of ground and flight courses to the public. One idea that has paid dividends is an aviation orientation course for Oakland business men and their wives that culminates in a hour's flight over the city.

Nelson plans to confine Transocean's efforts to the international field and specialize in mass movements of equipment and personnel that cannot be handled by scheduled air lines. Early in Transocean's career it was underbid on a juicy ATC contract carrying dependents to Tokyo.

"That turned out to be a blessing in disguise", says Nelson. "It got us out of the habit of leaning on the government and forced us to get out and hustle new commercial business to stay alive."

Transocean's profit and loss statements indicate it is still hustling successfully.

Delta Supply Costs Up 25 Percent

Airline favors uniform stock inventory practices; breakdown given on last year's expenditures.

Officials of Delta Air Lines, watching 1948 expenditures jump more than 25 percent above 1947 cost figures, believe the entire air transport industry would benefit if all airlines practiced uniformity in inventory control of minimum stock requirements.

They also feel that manufacturers should carry a large inventory of aircraft parts and supplies as a step toward stabilization of manufacturing activity and general improvement of production levels.

▶ **Spent 3 Million**—A breakdown of Delta's own 1947 supply costs has just been made available to AVIATION WEEK. It shows that this typical medium-sized air carrier spent $3,014,446 last year, buying from 150 suppliers in Atlanta, its home town, and 309 elsewhere. Itemized below, the list included $1,183,446 for parts and aircraft supplies, $1,542,000 for gas and oil, and $289,000 for food for passengers.

This year's parts and supplies costs will exceed the 25 percent increase after Delta receives its five DC-6s. First is to be delivered Sept. 30. All are to be in service by the end of the year. The carrier now operates seven DC-4s, 17 DC-3s and two cargo C-47s.

▶ **Turnover**—Last year Delta purchased 41,662 items to maintain its inventory stock of between 30,000 and 40,000. Inventory turnover is about twice a year. Efforts are being made to work down to a 60-day supply. That has not been achieved but the stock level is under a 90-day supply.

Value of the inventory is around $1,000,000, well over the $650,000 carried during 1947. High prices and a better balance in items are responsible. For some steel and aluminum parts, however, the supply problem is considerably worse than a year ago and inventory levels are higher than desired.

▶ **Airfreight Up**—Bright spot in Delta's operations is the growth in airfreight two years old Aug. 15. The line has experienced a progressive increase in tonnage during that period, and there is no indication it will level off. For the first seven months of this year Delta carried 926,856 ton-miles of airfreight compared with 306,195 in the same 1947 period.

The carrier showed a deficit for the fiscal year ended June 30 but hopes for a decision on back mail pay that will put it into the black.

▶ **Purchases Listed**—The following table shows the airline's purchases during 1947.

Engine Repair and Parts	
WAC	$ 24,580
P&W	173,348
Axle Accl	30,383
Overhaul engines by P&W	47,335
Airframe parts	278,920
Aircraft window glass	1,212
Aircraft oil coolers	4,208
Aircraft exhaust collector rings	15,321
Aircraft defroster shields	212
Aircraft heaters	1,282
Aircraft wheels and parts	17,316
Mechanics' & porters coveralls	3,874
Uniform and emblems	48,276
Spark plugs	12,747
Linoleum & Masonite—aircraft ticket counter & shop benches	1,381
Stationery & painting	21,197
Airplane tires—inc. retreading	20,452
Paints varnish lacquer & thinner	4,314
Plating	3,142
Office supplies	34,527
Office furniture	8,234
Teletype paper	12,215
IBM for services and forms	4,052
Airplane brake discs	34,346
Radio parts—aircraft	10,372
Ground comme lections	21,105
Laundry	4,873
Bolts & washers for aircraft & engines	4,232
Aircraft rug material	6,202
Schedule Folders	15,844
Distribution	338
Ignition harness	7,058
Ignition cable	4,748
Electrical supplies—parts	1,064
Flight instrument parts	2,343
Mill supplies	1,402
Boiler plate	852
Lumber	11,710
Skydyne for aircraft floor	2,372
Machining	183
Recharging & repairs for fire extinguishers	602
Grinding discs & wheels	470
Windshield wipers & parts	1,390
Carburetor parts	24,325
Starter parts	31,289
Magneto parts	2,833
Sandpaper & abrasives	172
Shock cord	249
Rubber gloves	487
Sponge rubber	275
Ground batteries	3,123
Aircraft batteries	1,120
Masking tape	2,822
Jacks for hangar use	232
Rubber hose	2,852
Propeller parts	38,333
Engine cleaning compounds	7,851
Sealing compounds for hangar floor	2,488
Valves, including poppet & cross feed	328
Landing light bulbs	1,013
Light bulbs for building including fluorescent starters	3,877
Machine shop power tool including repairs	8,783
Ducking	1,225
Lock nuts and washers	1,648
Safety wire	788
Decals	1,024
Special tools for engine overhaul	27,357
Battery charger bulbs & hydrometers	224
Aircraft bolts	2,321
Upholstery leather	1,223
Upholstery fabrics	6,000
Distilled water	81
Chewing gum for passengers	8,303
Shock mounts	
Radio	183
Engines	16,312
Aluminum and stainless steel sheets	2,276
Angle & flat iron	2,008
Rubber cement	484
Rubber sheet & strip	385
Cork sheet & strip	224
Steel tubing	7,413
Acetylene oxygen & compressed air	893
Typewriter repairs	887
Naphtha	1,134
Carbon tetrachloride	1,485
Bearings	
Instrument	411
Radio	807
Aircraft	654
Accessories	683
Electrical cable—aircraft	1,348
Janitor supplies	6,318
Soap for rest rooms	1,319
Toilet tissue & towels	2,111
Small tools & drills	1,114
Aircraft hardware	88,132
Miscellaneous	2,513
Deicer boots & repairs	15,328
Aircraft miniature light bulbs	1,015
Commissary supplies (PSGR)	31,224
Commissary equipment	1,821
Surgical supplies	203
Tool steel	202
Air condition units	5,217
Generator parts	7,018
Shipping supplies	841
Fuel pumps	2,864
Hydraulic valves	2,841
Switches	2,806
Electric motor repairs	153
Aircraft fittings	1,774
Mineral spirits	2,060
Plumbing supplies (misc.)	1,013
Flowers	303
Welding torches	235
Photographic supplies	4,128
Business cards	2,583
Delta Digest	3,732
Motor vehicle repairs & parts	1,348
Link trainer parts	621
Thermocouples	831
Cannon plugs	481
Flasher mechanism	533
Airmail labels	778
Hangar, shop & ramp equipment	4,731
Castings	93
Sporting goods	232
Total parts and supplies	$1,183,446
Food for passengers	289,000
Gasoline and oil	1,542,000
Total	$3,014,446

BERTHS ARE BACK

First transcontinental air sleeper service since before the war is to be inaugurated Sept. 1 by American Airlines. The carrier's "Mercury" DC-6 flight between New York and Los Angeles will offer eight berths daily in each direction. Normally equipped to carry 52 passengers in reclining chairs the AA DC-6s will be fitted with 36 seats plus four upper and four lower berths in the section aft of the cabin door. Extra charge will be $90. Double occupancy of the large lower berths will be permitted. American's plans to inaugurate postwar transcontinental sleeper service last November were delayed when the DC-6s were withdrawn from service for modification.

WAL Converts C-54 To All-Purpose Craft

At less than $5000 out-of-pocket expense, Western Air Lines has completed conversion of a C-54 cargo plane into an all purpose craft especially designed for charter and other special flight operations.

The plane's extra utility is achieved through installation of a row of seats facing the aisle on the left side of the fuselage. When in use, these seats give the craft a 40 passenger capacity; when not in use, they can be folded back to allow for cargo storage. The right seating section features a Pullman type arrangement with sections of four seats each. Special tables have been constructed to serve these sections so that passengers may carry on business conferences or play cards.

▶ **Commissary Equipment**—In the rear of the plane is a food and beverage bar, complete with commissary equipment. The craft has a buffet cart for both cold cuts and hot dishes which can be moved up and down the aisle or secured in the rear section for serving purposes.

Forward as well as aft sections of the C-54 (dubbed the "Chuck Wagon") have been finished in natural grain leather imprinted with western designs. These include well-known cattle brands, a map of WAL's routes and other western themes. The interior trim features redwood paneling in the aft section, red leatherette trim around the lower part of the fuselage, and a biege trim on the sides and ceiling.

▶ **Extra-Section Plane**—The "Chuck Wagon" which was converted entirely in Western's Los Angeles maintenance and overhaul shops, has been placed in service as an extra-section plane. Passenger reaction has been enthusiastic. Richard A. Dick, WAL vice president-sales, points out the craft is particularly suited for movement of athletic teams because of the ample baggage and cargo space for sports gear.

Nonluxury Items Also Go Overseas by Air

A theory that only expensive merchandise should go overseas by air is rapidly being punctured by airfreight shippers.

A recent survey at LaGuardia and New York International Airports showed one-third of the shipments and one-quarter weight consisted of merchandise valued less than $1 per lb.

Attempting to develop statistics on overseas air shipment, the Port of New York Authority, operator of the airports, took one day's exports and found:

- Twelve different air carriers hauled 1140 separate shipments.
- Average weight per shipment (excluding one of gold bullion) was about 40 lb.
- 94 percent of the shipments weighed less than 100 lb.
- Merchandise covered 44 different commodity classifications, ranging from art work, gold bullion and jewelry to chemicals, hearing aids, radios and sporting goods.

Transportation Course

American University, Washington, D. C., will conduct an Institute of Industrial Transportation and Traffic Management Nov. 2-23. The course will be designed for rail, air and foreign transportation executives and is designed to round out their knowledge.

Aviation speakers include Fred M. Glass, president, Air Cargo, Inc., Col. L. H. Brittin, executive director, the Air Freight Association, H. R. Brashear, director of traffic service, Aircraft Industries Association, and Myles Robinson, economic analyst, Air Transport Association.

Boost for All-Expense Air Tours

CAB examiner recommends certification of special carrier to conduct vacation trips abroad and in U. S.

Declaring that present arrangements between the regular airlines and travel agencies do not fully exploit the conducted tour market, a CAB examiner has recommended certification of a specialized carrier to operate all-expense vacation cruises both domestically and to foreign points

Examiner James S Keith has urged CAB to grant Resort Airlines, Pinehurst, N. C., a five year experimental certificate to operate from the co-terminals New York, Philadelphia, Washington, Pittsburgh, Cleveland, Detroit and Chicago to scenic or recreational points in the U. S, Canada, Central America and the Caribbean area Resort has been operating its "sky cruises" to vacation spots since November, 1945, on a nonscheduled basis or through special exemption from CAB

▶**AAXICO Applicant**—The North Carolina carrier was recommended for the vacation tour service in preference to American Air Export and Import Co, Miami Springs, Fla., which at one time in 1946 was the nation's largest nonscheduled passenger line AAXICO suspended its nonscheduled services early last spring.

More than a dozen presently certificated airlines, including American, Eastern, National, Pan American, TWA and United, are opposing the new services proposed by Resort and AAXICO. The regular carriers say they are meeting the demand for vacation tours and add that they will suffer substantial revenue diversion if the specialized operations are certificated

▶**Tour Promotion**—Examiner Keith conceded that the presently certificated airlines, with the cooperation of travel agencies, have done much to promote all-expense tours in the U. S and abroad, but he noted that most of the excursions were not of the conducted variety sought by Resort and AAXICO He pointed out that the certificated airlines usually leave management of escorted tours to the tour operators, many of whom show lack of initiative and unwillingness to take the financial risk involved

"This situation, together with the fact that travel agents also have a definite interest in promoting tours by surface conveyance, makes it appear that the arrangement between the certificated airlines and the agencies is not consistent with the best interests of air transportation so far as conducted travel is concerned," Keith declared. "A service which imposes on the carrier itself the responsibility for promoting and operating group-conducted tours would further stimulate the exploitation of this market"

The examiner said that while it is difficult to appraise the extent to which Resort's services will divert business from existing certificated operations, it does not appear that any substantial harm will result He emphasized that since mail carriage was not requested, the question of government subsidy is not directly involved.

▶**Traffic Potential**—Keith observed that the traffic potential of Resort's operations cannot be ascertained now but can only be established by actual operations One travel agency testified that 35,000 to 40,000 passengers should be attracted annually to conducted tours by air.

Resort estimates its entire system will attract 11,882 passengers annually, of which 4835 would take domestic skycruises and 7047 foreign tours Proposed fare is five cents a mile domestically and seven cents face outside the U. S

Now operating DC-3s, Resort estimates a fleet of two 50-passenger DC-4s and eight 21-passenger DC-3s would handle its proposed certificated operation.

Pan American Started Something

Trans-Atlantic travel fare will be 33 percent more than the current one-way fare

Pan American World Airways was first with a proposed excursion fare 25 percent less than the present roundtrip rate (AVIATION WEEK, Aug. 23). Other flag carriers, at first mum on PAA's proposal, came out with a still-further reduction Pan Am promptly met the new cut, a negligible one Under Pan Am's previous reduction, roundtrip fare to London would have been $472 50 Now it will be $466 70, a difference of $5.80.

▶**Notices Filed**—The carrier has filed two notices with CAB and has notified other IATA members of its intention to establish the excursion rates, effective Oct 1. The new rate schedule expires Apr. 1, 1949.

The time limit on use of the return ticket also has been changed. Previously, PAA proposed a 60-day limit but changed to 30 days when other trans-Atlantic carriers chose the shorter period.

SHORTLINES

▶**Aerovias "Q"**—Has asked CAB for a foreign air carrier permit to operate from Havana, Cuba, its home base, to Miami Company now has authority for Havana-Key West flights. Including two planes which will be available within 60 days, Aerovias "Q" has six DC-3s and two cargo C-46s.

▶**BOAC**—Carried 57,735 passengers on its world-wide routes in the first half of 1948, up 14 percent over the 48,498 handled in the same 1947 period.

▶**Golden North Airways**—Has asked CAB for an immediate temporary exemption order to operate on schedule between Fairbanks, Alaska, its home base, and Seattle.

▶**KLM**—Reports transfer of its operations and that of a Swissair (Swiss Air Transport Co.) from LaGuardia Field to New York International (Idlewild) Airport. KLM is general agent in the U. S for Swissair

▶**Mt. McKinley Airways**—Flew 1062 revenue passengers and 54 tons of cargo during the second quarter of 1948 Activated in April, 1946, the Anchorage, Alaska, carrier has flown over nine million passenger miles since then, largely to Seattle on a nonscheduled basis Company has two DC-3s.

▶**National**—Plans to inaugurate service at Baltimore, Richmond, and Panama City, Fla., on Sept 1.

▶**Pan American**—Is adding 1500 employees to the 4000 already on its Miami payroll to staff its new overhaul base. Nearly 1000 of the 1500 persons to be hired by the end of October will be mechanics and technicians, but the new personnel also will include 21 engineers, 31 inspectors, 125 assistant foremen and several score draftsmen and clerks

▶**Peruvian International**—Has reduced flying time from New York and Washington to Santiago, Chile, by 10½ hr by eliminating the overnight layover at Lima, Peru

▶**Southwest**—Has received temporary authority to serve Crescent City, Calif., and plans to start flights Sept 1

▶**United**—Directors have authorized payment of the regular quarterly dividend of $1 12 per share on the corporation's 4½ percent cumulative preferred stock . . . Full resumption of service into Portland, Ore (Columbia) Airport, flooded early in the summer, is scheduled for Sept. 1. UAL has been serving Portland temporarily through Salem and Troutdale, Ore., fields Twenty-two senior captains have been promoted to assistant flight managers at six key stations They will fly as captains in schedule six months each year during alternate months . . . UAL expects to begin construction of a $300,000 "minimum unit" hangar at Seattle-Tacoma airport within the next few months provided certain leases are approved by the Seattle Port Commission. United now serves Seattle through Boeing Field.

▶**Universal Air Cargo**—Has added Bremerton, Wash., to its list of bases and will keep two DC-3s there. The charter company has seven planes and operates from Nome, Fairbanks, Juneau and Anchorage, Alaska, Spokane, Wash., and San Francisco.

▶**Western**—Plans to replace DC-3s with Convair-Liners on its Los Angeles-San Francisco-Portland-Seattle run Sept 1.

Business Picks Up At Idlewild

New York International Airport (Idlewild) isn't so empty as it used to be. For the first week following the official opening, the terminal recorded 362 plane movements Of these, 98 were by scheduled carriers. Nonscheduled and contract carriers accounted for 17, private and company aircraft, 118, and military and governmental craft, 129.

Four foreign flag carriers are now using the 4900-acre terminal for their trans Atlantic operations. KLM, Sabena, SAS and Air France have moved into the new terminal SAS has transferred its operations and technical personnel from the company's New York City office to the airport, consolidating the operations and ground service departments.

CAB SCHEDULE

Aug. 30—Oral argument on Aerovias Nacionales de Colombia's application for foreign air carrier permit. (Docket 3249.)

Sept. 3—Prehearing conference on application for approval of agreement to transfer Western Air Lines San Diego-Yuma, Ariz., route segment to Arizona Airways. (Docket 3442.)

Sept. 9—Prehearing conference on need for equipment interchange arrangements at St. Louis and Memphis. (Docket 3456.)

Sept. 13—Oral argument in airfreight case. (Docket 910, et al.)

Sept. 27—Hearing on CAB's investigation of free and reduced rate transportation. (Docket 2727, et al.)

Sept. 29—Oral argument in TACA, S. A., foreign air carrier permit renewal and amendment case (Docket 3016.)

Oct. 4—Hearing in Capital Airlines mail rate case (Docket 424.)

Oct. 4—Hearing on route consolidation applications of American, Eastern and TWA. (Docket 2551, et al.)

Oct. 11—Hearing in U. S.-Alaska service case. (Docket 2386, et al.)

Oct. 18—Hearing on Board's enforcement action against Standard Air Lines. (Docket 3357.)

Dec. 1—Hearing on additional U. S.-Puerto Rico service. (Docket 2123, et al.)

PICTURE CREDITS

Bachrach, 37 (left) McGraw-Hill World News, 11. Wide World, 28

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LETTERS

Comments on an Editorial

(Following are a few letters received on the editorial in AVIATION WEEK Aug 9, "An Industry Loses Its Vision")

It seems to me this editorial overlooks the philosophy of regulated competition in the common carrier field and draws incorrect conclusions

You refer to the "American system of competition" The American system of competition for common carriers by rail, motor, and air is one of regulated and limited competition It was applied to the railroads in 1920, to the motor carriers in 1935, and to the air carriers in 1938 The people referred to in your editorial could not have bought surplus trucks and entered the motor carrier field at all without prior permission from the ICC They entered air transportation without seeking permission because they masqueraded under the guise of contract carriers or nonscheduled common carriers Contract carriers are not regulated by the Civil Aeronautics Act, but are regulated by the Motor Carrier Act Nonscheduled common carriers were covered by an old exemption issued to apply to small fixed base operators These carriers did not limit themselves to contract or nonscheduled operation

The CAB, instead of applying the provisions of the law and stopping this unauthorized common carrier operation, issued a regulation permitting them to engage in a limited common carrier operation

We feel that the Board went beyond the intent of Congress in exempting these carriers from the provisions of the law which requires certificates of convenience and necessity I am not referring to bona fide fixed base charter operators, because the companies about which you are writing are not engaged in such business

The only handicap in the Act is its failure to regulate contract carriers The companies referred to in your editorial are undertaking to engage in common carrier transportation and the Civil Aeronautics Act is adequate to deal with them It prohibits such an operation until and unless convenience and necessity has been proven and the Board has issued the certificate.

You refer to an industry being "throttled" This seems to me to be an erroneous conclusion because the carriers you are defending are not trying to establish a new industry, but are engaged in the same industry as are the certificated carriers but without first complying with the provisions of the law

It is not the "free meals and other refinements" to which you refer that makes up the difference between the cost of the operation of the certificated airlines and that of the companies which your editorial defends The difference lies in the whole system of safety and economic regulation imposed upon the certificated airlines, much of which is not imposed upon the operators you defend

Your references to increase in mail pay and in passenger fares entirely overlook the increase in everything that goes into the operation of the certificated airlines The rates being received for mail, in most cases, and the passenger fares now in existence, do not represent an increase commensurate with the increased cost of operation resulting from the inflationary spiral which envelops our country

We certainly do not question your sincerity We do believe, however, that your thinking disregards the philosophy of the system of regulation which the Congress has applied to all common carriers We believe it overlooks the fact that the companies you defend are not required to operate under the same conditions that are applied to the certificated carriers

The effect of what you advocate it seems to me, would be to go back to the cut-throat unregulated competition existing prior to 1938 This condition failed to produce a sound air transportation system just as it had failed to produce a sound railroad system There is no reason to believe that the return to unregulated competition would result in anything but bankruptcy and chaos.

Before advocating a change in the fundamental policy of the Civil Aeronautics Act, may I suggest that you refresh your recollection of the impact of the last depression upon the transportation system and review the reports of the Federal Coordinator of Transportation and the legislative history of the Civil Aeronautics Act If you do, I feel sure that you will agree that there is much more to be said for the policy embodied in the act than your editorial implies

ROBERT RAMSPECK
Executive Vice President
Air Transport Association

(The editorial did not advocate "cut-throat unregulated competition" But it warned that if the certificated industry continues to raise fares and demand higher mail pay, without cleaning its own house and making air transportation available to more people, it can expect drastic action by sheer pressure of public opinion Since writing the editorial we would guess that some major carrier will go out after the second class transcontinental fare market Why none of them has done it up to now might answer the question "Why does an industry lose vision?"—Ed. Note)

Your editorial ... is a masterpiece I think you have a better grasp of this business and of its potentials than almost any one I know I want to congratulate you again on your courage and forthrightness To have the reputation of speaking the truth as you see it, regardless of how it affects important advertising interests, builds for you and the organization of which you are a part a reputation with a wider public, which is the only basis for true greatness More power to you

(A FORMER MEMBER OF CAB)

God bless you for your editorial of Aug 9!

RAY NEUMANN
Public Relations Director
Slick Airways, Inc

Congratulations on your article Aug 9 I was beginning to wonder if we had a free press

FRED A MILLER, President
Air America, Inc

Your editorial was extremely encouraging

R PAUL WRESNER, President
Nationwide Air Transport Service

I see by Friday's Daily that you don't know what the hell you are talking about It seems you have a lack of information on transport economics which is very glaring

Any of you can have all of our books to look through any time you care to I will bring them myself so you can see what it costs to run airplanes What the Daily doesn't know is how anyone can run an airline without a subsidy It thinks anybody who says he can is in the next world . . .

(A CARGO AIRLINE PRESIDENT)

(American Aviation Daily said: "The strong editorial position taken by an aviation weekly trade paper against scheduled airlines in favor of cut rate passenger-carrying non-skeds is an intriguing new phenomenon in trade journalism Lack of perspective in public utility regulation and lack of information on transport economics are both glaring shortcomings in the weekly's anti-airline position" The Daily carefully errs The editorial was pro-public The only excuse for any transportation is public service If by being strongly pro-public one becomes anti-airline, there is something wrong with the airlines For the public cares not whether it flies in a non-sked or a sked if it can get a safe service it can afford Aviation will never prosper until it is mass transport and mass transport will never come with constantly rising fares And a trade paper that occasionally leads industry opinion instead of being content to follow it may be "an intriguing new phenomenon" to the Daily but McGraw Hill has been encouraging that sort of thing for many years—Ed Note).

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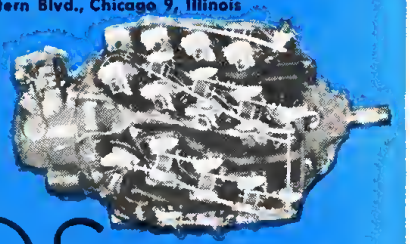

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